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Section 3: Liquid Lasers

Section 3.1

ORGANIC DYE LASERS

Introduction to the Table

Organic dye lasers are tabulated in order of increasing wavelength of the gain maximum in Table 3.1.1. Lasers that have been tuned over a range of wavelengths are listed by the lowest wavelength reported or the range is listed in parentheses after the gain maximum. The tuning range given is that for the experimental configuration and conditions used and may not represent the extremes possible. In the following columns the dye and solvent are given together with the pump source and primary reference to laser action.

The wavelength, tuning range, and output of dye lasers depend on the characteristics of the dye, the dye concentration, solvent, optical pumping source and rate, optical cavity, and other operating conditions. The multiple listings of a given dye at several wavelengths reflect these differences. The original references should be consulted for the experimental conditions used and their effects on the lasing wavelength.

Chemical nomenclature

The names of various dyes found in the literature have in many instances been reduced to relatively simple pseudo acronyms by reducing the important parts of the name to a letter or by the assignment of a number to more complex molecules. The reader is referred to Steppel, R. N., Organic Dye Lasers, in *Handbook of Laser Science and Technology, Vol. I: Lasers and Masers*, CRC Press, Boca Raton, FL (1982), p. 299; Steppel, R. N., Organic Dye Lasers, in *Handbook of Laser Science and Technology, Suppl. 1: Lasers*, CRC Press, Boca Raton, FL (1991), p. 219; and Maeda, M., *Laser Dyes*, Academic, New York (1984) for common names of the dyes and details of the dye structures. The chemical names have been abbreviated according to the nomenclature system previously used by Fletcher. The shorthand notation for the parent compounds and substituents are as follows with numbers referring to the skeletal position (see numbered structure): AQ, azaquinolone; Q, quinolone; AC, azacoumarin; C, coumarin; A, amino; M, methyl; DM, dimethyl; DMA, dimethyl-amino; DEA, diethylamino; MO, methoxy; MOR, morpholino; TFM, trifluoromethyl; and OH, hydroxy. Thus 7A-M-AQ designates 7-amino-4-methylazaquinolone. Literature descriptions such as AQIF, QIF and C2H are not necessarily systematic. The first letter(s) refer to the family whereas the H and F refer to hydrogen and fluorine substitution.

Commercial dyes may have different nomenclature depending upon the producer. Some synonyms for laser dyes are given below:

BBQ	BiBuQ
BPBD-365	Butyl PBD
Coumarin 440	Coumarin 120
Coumarin 450	Coumarin 2
Coumarin 456	Coumarin 4

Coumarin 460	Coumarin 1, Coumarin 47
Coumarin 461	Coumarin 311
Coumarin 478	Coumarin 106
Coumarin 480	Coumarin 102
Coumarin 481	Coumarin 152A, Coumarin 1F
Coumarin 485	Coumarin 152 Coumarin 2F
Coumarin 490	Coumarin 151 Coumarin 3F
Coumarin 500	Coumarin SA-28
Coumarin 503	Coumarin 307
Coumarin 504	Coumarin 314
Coumarin 515	Coumarin 30
Coumarin 519	Coumarin 343
Coumarin 521	Coumarin 334
Coumarin 522	Coumarin 8F
Coumarin 523	Coumarin 337
Coumarin 535	Coumarin 7
Coumarin 540	Coumarin 6
Coumarin 540A	Coumarin 153
Cresyl Violet 670 Perchlorate	Kresylviolett
Disodium Fluorescein	Uranin
DMOTC	Methyl DOTC (DmOTC-1)
DMT	BM-Terphenyl
Fluorescein 548	Fluorescein 27, Fluorescein
Fluorol 555	Fluorol 7GA
HIDC lodide	Hexacyanin 2
HITC lodide	Hexacyanin 3
IR-5	Q-switch 5
IR-26	Dye 26
Kiton Red 620	Sulforhodamine B
LD 390	Quinolon 390
LD 466	Coumarin 466
LD 490	Coumarin 6H
LD 690 Perchlorate	Oxazine 4 Perchlorate
LD 700 Perchlorate	Rhodamine 700
LD 800	Rhodamine 800
LDS 698	Pyridine 1
LDS 722	Pyridine 2
LDS 730 Perchlorate	Styryl 6
LDS 750	Styryl 7*
LDS 751	Styryl 8*
LDS 798	Styryl 11
LDS 821	Styryl 9/9M
LDS 925	Styryl 13
LDS 950	Styryl 14
Nile Blue 690 Perchlorate	Nileblau

Oxazine 725 Perchlorate	Oxazine 1 Perchlorate
Oxazine720 Perchlorate	Oxazine 170 Perchlorate
p-Quaterphenyl	PQP
p-Terphenyl	PTP
Phenoxazone 660	Phenoxazone 9
Rhodamine 560 Chloride	Rhodamine 110
Rhodamine 590 Chloride	Rhodamine 6G
Rhodamine 610 Chloride	Rhodamine B
Rhodamine 640 Perchlorate	Rhodamine 101
Stilbene 420	Stilbene 3
Sulforhodamine 640	Sulforhodamine 101

* These two dyes are the same as originally reported by Kato. Dyes supplied by various sources should be consulted to verify that their products correspond to these dyes.

Abbreviations used in Table 3.1.1:

Excitation sources:

Ar (argon-ion laser), bb (broad band), coax (coaxial flashlamp), Cu (copper vapor laser), cw (continuous wave), FL (flashlamp), Kr (krypton-ion laser), KrF (krypton fluoride excimer laser), L (laser), N_2 (nitrogen laser), Nd:glass (neodymium:glass laser), Nd:YAG (neodymium:yttrium aluminum garnet laser), triax (triaxial flashlamp), XeCl (xenon chloride excimer laser).

Solvents:

Ar (argon), BuOAc (butylacetate), BzOH (benzyl alcohol), CCl_4 (carbon tetrachloride), CH_3CN (acetonitrile), CH_3COOH (acetic acid), COT (cyclooctetraene), DB (o-dichlorobenzene), DCE (1,2-dichloroethane), DEC (diethylcarbonate), DEE (diethyl ether), DMA (N,N-dimethylacetamide), DMA/EtOH (dimethylacetamide/ethanol), DMF (N,N-dimethyl-formamide), DMF/EtOH (dimethylformamide/ethanol), DMSO (dimethyl-sulfoxide), DPA (N,N-dipropylacetamide), DX (purified dioxane), EG (ethylene glycol), EtOH (ethanol), EtOH/H_2O (ethanol/water), G (glycerol), glyme (1,2-dimethoxyethane), H_2O (water), HCl (hydrochloric acid), HFIP (hexafluoroisopropanol), HFIP/H_2O (hexafluoroisopropanol/water), LO (ammonyx LO), MC (methylene chloride), MCH (methylcyclohexane), MeOH (methanol), MeOH/H_2O (methanol/water), NB (nitrobenzene), NMP (N-methylpyrrolidone), PPH (1-phenoxy-2-propanol), 2-PrOH (2-propanol), TEA (triethylamine), TFE (trifluoroethanol), THF (tetrahydrofuran), a (acidic), c (cyclohexane), d (DMF), e (ethanol), g (glycerol), m (DMA), p (p-dioxane), t (toluene), w (water).

Further Reading

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Table 3.1.1
Organic Dye Lasers Arranged in Order of Increasing Wavelength

Wavelength (nm)	Laser dye*	Solvent	Pump	Ref.
332 (311–360)	terphenyl	cyclohexane	KrF(248)	1
336 (331–342)	oligophenylene 2-1-7	ethanol	KrF(249)	2
336 (331–342)	oligophenylene 2-1-9	ethanol	KrF(249)	2
337	p-terphenyl	cyclohexane	KrF(248)	3
338	p-terphenyl	ethanol	KrF(248)	3
338 (326–358)	p-terphenyl	—	KrF(248)	4
339 (322–366)	p-terphenyl	cyclohexane	KrF(248)	1
339 (332–346)	oligophenylene 2-1-10	ethanol	KrF(249)	2
340	p-terphenyl	p-dioxane	KrF(248)	5,6
340 (323–364)	p-terphenyl	cyclohexane	KrF(248)	7
341	p-terphenyl	DMF	FL	8
347	oxadiazole	cyclohexane	KrF(249)	9
347	oxadiazole	ethanol	KrF(249)	9
353	oxadiazole	ethanol	KrF(249)	9
357	oxadiazole	ethanol	KrF(249)	9
359	oxadiazole	ethanol	KrF(249)	9
362	p-quaterphenyl	cyclohexane	Nd:YAG(266)	10
362–390	p-quaterphenyl	DMF	FL	8
365 (359–391)	oxazole:PPO	toluene	N_2(337)	11
372	oxadiazole	toluene	N_2(337)	12
372	oxazole:PPO	cyclohexane	KrF(248)	3
373	oxadiazole	toluene	N_2(337)	12
374	p-quaterphenyl	toluene	N_2(337)	3
375	oxadiazole	toluene	N_2(337)	12
375–380	pteridine	methanol	N_2(337)	10
377	oxadiazole	toluene	N_2(337)	12
377 (365–400)	Exalite 337E	EG	Ar	13
379	oxadiazole	toluene	N_2(337)	12
380	p-quaterphenyl	cyclohexane	KrF(248)	5
380 (372–406)	oxadiazole	toluene	N_2(337)	11
381	oxazole:POPOP	vapor(Ar+N_2)	e-beam	14
381	oxazole:PPO	cyclohexane	FL	8
381–389	p-quaterphenyl	butanol	FL	15
382 (373–391)	p-quaterphenyl	cyclohexane	Nd:YAG(266)	10
385–415	oxazole:α-NPO	cyclohexane	N_2(337)	16
386	oligophenylene 2-4-7	DMA/EtOH:4/1	FL	17
386	oligophenylene 2-4-7	ethanol	FL	17
386	oligophenylene 2-5-5	DMA/EtOH:1/4	FL	18

Table 3.1.1
Organic Dye Lasers Arranged in Order of Increasing Wavelength

Wavelength (nm)	Laser dye*	Solvent	Pump	Ref.
386	p-quaterphenyl	—	KrF(248)	6
386 (373–399)	p-quaterphenyl	toluene/ethanol	N_2(337)	20
386 (380–391)	oligophenylene 2-3-15	p-dioxane	XeCl(308)	21
388	oxazole 4-4-1	p-dioxane	XeCl	22
389	oligophenylene 2-5-4	ethanol	FL	18
332 (311–360)	terphenyl	cyclohexane	KrF(248)	1
336 (331–342)	oligophenylene 2-1-7	ethanol	KrF(249)	2
336 (331–342)	oligophenylene 2-1-9	ethanol	KrF(249)	2
337	p-terphenyl	cyclohexane	KrF(248)	3
338	p-terphenyl	ethanol	KrF(248)	3
338 (326–358)	p-terphenyl	—	KrF(248)	4
339 (322–366)	p-terphenyl	cyclohexane	KrF(248)	1
339 (332–346)	oligophenylene 2-1-10	ethanol	KrF(249)	2
340	p-terphenyl	p-dioxane	KrF(248)	5,6
340 (323–364)	p-terphenyl	cyclohexane	KrF(248)	7
341	p-terphenyl	DMF	FL	8
347	oxadiazole	cyclohexane	KrF(249)	9
347	oxadiazole	ethanol	KrF(249)	9
353	oxadiazole	ethanol	KrF(249)	9
357	oxadiazole	ethanol	KrF(249)	9
359	oxadiazole	ethanol	KrF(249)	9
362	p-quaterphenyl	cyclohexane	Nd:YAG(266)	10
362–390	p-quaterphenyl	DMF	FL	8
365 (359–391)	oxazole:PPO	toluene	N_2(337)	11
372	oxadiazole	toluene	N_2(337)	12
372	oxazole:PPO	cyclohexane	KrF(248)	3
373	oxadiazole	toluene	N_2(337)	12
374	p-quaterphenyl	toluene	N_2(337)	3
375	oxadiazole	toluene	N_2(337)	12
375–380	pteridine	methanol	N_2(337)	10
377	oxadiazole	toluene	N_2(337)	12
377 (365–400)	Exalite 337E	EG	Ar	13
379	oxadiazole	toluene	N_2(337)	12
380	p-quaterphenyl	cyclohexane	KrF(248)	5
380 (372–406)	oxadiazole	toluene	N_2(337)	11
381	oxazole:POPOP	vapor(Ar+N_2)	e-beam	14
381	oxazole:PPO	cyclohexane	FL	8
381–389	p-quaterphenyl	butanol	FL	15
382 (373–391)	p-quaterphenyl	cyclohexane	Nd:YAG(266)	10

Table 3.1.1
Organic Dye Lasers Arranged in Order of Increasing Wavelength

Wavelength (nm)	Laser dye*	Solvent	Pump	Ref.
385–415	oxazole:α-NPO	cyclohexane	N_2(337)	16
386	oligophenylene 2-4-7	DMA/EtOH:4/1	FL	17
386	oligophenylene 2-4-7	ethanol	FL	17
386	oligophenylene 2-5-5	DMA/EtOH:1/4	FL	18
386	p-quaterphenyl	—	KrF(248)	6
386 (373–399)	p-quaterphenyl	toluene/ethanol	N_2(337)	20
386 (380–391)	oligophenylene 2-3-15	p-dioxane	XeCl(308)	21
388	oxazole 4-4-1	p-dioxane	XeCl	22
389	oligophenylene 2-5-4	ethanol	FL	18
389–395	oxazole 4-6-1	ethanol	ruby(316)	28
389–395	p-quaterphenyl	DMF	FL	15
390	oxazole 4-4-2	p-dioxane	XeCl	22
390 (370–410)	p-quaterphenyl	DMF	FL	25
390 (385–417)	oxadiazole	toluene	N_2(337)	11
390–395	α-NPO	ethanol, w, t	N_2(337)	27
390–445	7-diethylamino	ethanol, w, t	N_2(337)	27
391	oligophenylene 2-4-8	DMF/EtOH:4/1	FL	17
391	oligophenylene 2-4-8	ethanol	FL	17
391	oligophenylene 2-5-6	DMA/EtOH:1/4	FL	18
391 (380–410)	p-quaterphenyl	EtOH/toluene:1/1	Nd:YAG(355)	28
393	oxazole:POPOP	vapor	N_2(337)	29
393 (375–410)	Exalite 392E	EG	Ar	30,31
395	oligophenylene 2-5-7	DMA/EtOH:1/4	FL	18
395–402	oxazole:4PyPO	ethanol	N_2(337)	32
400	oxazole:α-NPO	ethanol	FL	7
400 (385–425)	Exalite 400E	EG	Ar	30,59
400–420	diphenyl-stilbene	ethanol, w, t	N_2(337)	27
406 (396–416)	stilbene:DPS	p-dioxane	N_2(337)	20
407	furan 1-1-3	toluene	N_2(337)	32
409	stilbene:DPS	DMF	FL	8
411	sodium salicylate	DMF, t, w	XeCl(308)	33
413 (408–422)	styrybenzene	p-dioxane, THF	N_2(337)	34
414	9-methylanthracene	EtOH/MeOH:4/1	N_2(337)	35
414	9,10-dimethylanthracene	MCH/toluene:2/1	N_2(337)	35
414	coumarin;3,7-substituted	benzene	N_2(337)	36
414 (408–423)	styrybenzene	p-dioxane, THF	N_2(337)	36

Table 3.1.1
Organic Dye Lasers Arranged in Order of Increasing Wavelength

Wavelength (nm)	Laser dye*	Solvent	Pump	Ref.
415	furan 1-1-1	toluene	N_2(337)	32
415	p-terphenyl	DMF	FL	25
415	Stilbene 1	EG	Kr(UV)	39
415–430	oxazole:POPOP	THF	N_2(337)	16
416	9-dichloroanthracene	ethanol	N_2(337)	35
416	Blankophor R	methanol	N_2(337)	40
416	miscellaneous 13-1-1	DMSO	N_2(337)	41
416 (403–437)	oxazole	toluene	N_2(337)	42
417	9-phenylanthracene	ethanol	N_2(337)	35
417	coumarin:7A-4MO-C	ethanol	FL	43
417–427	p-terphenyl	ethanol (sat.)	N_2(337)	36
418	4-phenylpyridine	ethanol	N_2(337)	44
418	furan 1-1-4	toluene	N_2(337)	32
419	oxazole:POPOP	toluene	FL	46
419 (410–439)	styrybenzene	toluene	N_2(337)	34
419–424	oxazole:POPOP	ethanol	FL	186
420	furan 1-1-5	toluene	N_2(337)	32
420 (413–431)	styrybenzene	methanol	N_2(337)	34
420–470	Stilbene 420; Stilbene 3	EG	Ar(UV)	49
421	coumarin;3,7-substituted	benzene	N_2(337)	36
422 (412–432)	triazolstilbene	methanol	N_2(337)	40
422–430	oxazole 4-6-3	H_2O/HOAc:95/5	ruby(316)	28
423	coumarin;3,7-substituted	benzene	N_2(337)	36
423 (413–431)	styrybenzene	methanol	N_2(337)	34
423 (414–442)	oxazole:POPOP	toluene	N_2(337)	42
424 (411–436)	Stilbene 420; Stilbene 3	methanol	Nd:YAG(355)	51
425	furan 1-1-2	toluene	N_2(337)	32
425	oxadiazole	methyl chloride	N_2(337)	36
425 (400–480)	Stilbene 420; Stilbene 3	—	Kr(UV)	167
425 (408–453)	Stilbene 420; Stilbene 3	methanol	N_2(337)	34
425 (414–438)	triazolstilbene	methanol	N_2(337)	52
425 (416–437)	styrybenzene	p-dioxane, THF	N_2(337)	34
425 (418–443)	triazinylstilbene	methanol	N_2(337)	52

Table 3.1.1
Organic Dye Lasers Arranged in Order of Increasing Wavelength

Wavelength (nm)	Laser dye*	Solvent	Pump	Ref.
426	coumarin;3,7-substituted	benzene	N_2(337)	36
427 (410–459)	triazolstilbene	methanol	N_2(337)	40
427 (411–465)	oxazole:POPOP	p-dioxane	N_2(337)	40
427 (414–451)	Tinopal PCRP	p-dioxane	N_2(337)	40
429 (404–460)	stilbene 420; stilbene 3	methanol	Nd:YAG(355)	53
429 (406–465)	triazinylstilbene	methanol	N_2(337)	40
~430	oxazole:dimethylPOPOP	p-dioxane	FL	32
430	9,10-diphenylanthracene	ethanol	N_2(337)	35
430	coumarin;3,7-substituted	dichloromethane	N_2(337)	36
430	triazolstilbene	benzene	N_2(337)	36
430 (412–462)	triazinylstilbene	methanol	N_2(337)	40
430 (420–438)	triazinylstilbene	methanol	N_2(337)	52
430 (420–445)	triazinylstilbene	methanol	N_2(337)	52
430–445	POPOP	ethanol, w, t	N_2(337)	27
430(418–465)	oxazole:dimethylPOPOP	p-dioxane	N_2(337)	11
431 (415–458)	stilbene 420; stilbene 3	H_2O+NP-10	N_2(337)	34
431 (419–448)	triazinylstilbene	methanol	N_2(337)	52
432	9,10-diphenylanthracene	MCH/toluene:2/1	N_2(337)	35
432 (406–448)	stilbene 420; stilbene 3	EG,methanol:9/1	Ar(UV)	162
432 (407–460)	triazolstilbene	methanol	N_2(337)	40
432 (412–464)	triazolstilbene	methanol	N_2(337)	40
432.6	9,10-diphenylanthracene	cyclohexane	ruby(347)	194
433 (418–448)	triazinylstilbene	methanol	N_2(337)	52
433 (418–449)	triazinylstilbene	methanol	N_2(337)	52
433 (418–461)	triazinylstilbene	methanol	N_2(337)	52
433 (420–447)	triazinylstilbene	methanol	N_2(337)	52
434	coumarin;3,7-substituted	benzene	N_2(337)	36
434	Delft Weiss BSW	methanol	N_2(337)	40
434 (414–472)	Tinopal RBS	MeOH/p–dioxane	N_2(337)	40
435	bimane 5–1–5	p–dioxane	FL	50

Table 3.1.1
Organic Dye Lasers Arranged in Order of Increasing Wavelength

Wavelength (nm)	Laser dye*	Solvent	Pump	Ref.
435-450	diphenyl–anthracene	ethanol, w, t	N_2(337)	27
436	coumarin:CSA–1	ethanol	FL	43,44
436 (410-462)	triazinylstilbene	methanol	N_2(337)	40
436 (417–455)	triazolstilbene	H_2O, NP10	N_2(337)	52
437	coumarin;3,7-substituted	benzene	N_2(337)	36
437 (420–457)	coumarin:CSA-1	ethanol	N_2(337)	20
438	coumarin;3,7-substituted	benzene	N_2(337)	36
438 (419–466)	coumarin:CSA-1	ethanol	N_2(337)	56
439	coumarin;3,7-substituted	benzene	N_2(337)	36
439	salicylamide	DMF	XeCl(308)	57
440	coumarin:CSA-10	ethanol	N_2(337)	44
440	coumarin:CSA-8	ethanol	N_2(337)	44
440	coumarin:CSA-9	ethanol	N_2(337)	44
440 (419–469)	coumarin:CSA-1	methanol	FL	59
440 (424–475)	Tinopal GS	methanol	N_2(337)	40
441	coumarin:CSA-1	ethanol	Nd:YAG(355)	60
442	coumarin:CSA-1	ethanol	FL	61
442	pyrylium salt	dichloromethane	N_2(337)	36
442 (425–443)	coumarin:CSA-1	ethanol	FL	25
442 (426–458)	coumarin:CSA-1	methanol	Nd:YAG(355)	51
442 (435–455)	coumarin:CSA-1	MeOH/H_2O:1/1	FL	19
445	coumarin:CSA-6	ethanol	N_2(337)	44
445	coumarin:CSA-6	MeOH/H_2O:1/1	FL	26
445 (421–468)	stilbene 420; stilbene 3	H_2O	N_2(337)	34
445–490	4-methylcoumarin	ethanol, w, t	N_2(337)	27
446	coumarin 450; 2	ethanol	FL	37
446	coumarin;3,7-substituted	methanol	N_2(337)	36
446 (428–465)	coumarin 450; 2	ethanol	N_2(337)	20
447	miscellaneous 13–1–2	DMSO	N_2(337)	41
447 (423-461)	triazinylstilbene	methanol	N_2(337)	52
448	pyrylium salt	dichloromethane	N_2(337)	36
449 (435–479)	coumarin 450; 2	ethanol/1.5%LO	FL	25
449 (436–493)	stilbene 420; stilbene 3	EG,methanol:9/1	Ar(UV)	162
450	coumarin:C3H	ethanol	FL	191
450	coumarin:CSA-4	ethanol	N_2(337)	44
450	coumarin:CSA-5	ethanol	N_2(337)	44

Table 3.1.1
Organic Dye Lasers Arranged in Order of Increasing Wavelength

Wavelength (nm)	Laser dye*	Solvent	Pump	Ref.
450	coumarin;3,7-substituted	water	N_2(337)	36
450 (420–470)	coumarin:CSA-1	DPA,COT	Ar(351/364)	37
450 (427–477)	coumarin:CSA-1	EG	Ar(cw)	47
450 (427–488)	coumarin 450; 2	methanol	FL	59
450 (435–485)	coumarin 450; 2	EG	Ar or Kr(uv)	164
450–511	coumarin 6-4-2	ethanol	XeCl	24
451–465	coumarin 6-1-2	hexane(Ar)	FL(triaxial)	38
452	oxazole 4-2-7	H_2O	ruby(347)	45
452 (430–492)	coumarin 450; 2	EG	Ar(cw)	47
452–480	coumarin 6-1-2	toluene(Ar)	FL(triaxial)	38
453	coumarin 311	ethanol	FL	54
453	coumarin:CSA-1	water	FL	55
453–514	coumarin 6-4-1	ethanol	XeCl	24
454	coumarin 450; 2	methanol	FL	61
454	coumarin 450; 2	methanol	Nd:YAG(355)	60
455	coumarin C3F:CSA-29	ethanol	N_2(337)	44
455 (433–474)	coumarin 450; 2	methanol	Nd:YAG(355)	51
456	coumarin CSA-11	ethanol	N_2(337)	44
457	coumarin 175	water	FL	55
457	coumarin 311	ethanol	FL	58
457	coumarin;3,7-substituted	water	N_2(337)	36
457 (440–478)	coumarin 460; 1	ethanol	N_2(337)	20
457 (450–484)	coumarin 460; 1	ethanol	FL	25
458	coumarin 450; 2	methanol	FL	191
458	coumarin;3,7-substituted	methanol	N_2(337)	36
458–474	coumarin 6-1-2	toluene(air)	FL(triaxial)	38
458–503	pyrylium dye 14	CH_3CN	N_2(337)	190
~460	coumarin 138	ethanol	N_2(337)	120
460	coumarin 460; 1	ethanol	Nd:YAG(355)	96
460	coumarin 460; 1	ethanol	FL	43,61
460	coumarin 460; 1	ethanol	FL	62
460	coumarin:CSA-6	EG	Ar(cw)	63
460	pteridine	MeOH, alkaline	N_2(337)	10
460 (430–480)	coumarin 450; 2	20%aq. DPA	Ar(351/364)	192
460 (442–490)	coumarin 460; 1	—	Nd:YAG(355)	53
460 (445–482)	coumarin 450; 2	$MeOH/H_2O$:4/6	FL	19

Table 3.1.1
Organic Dye Lasers Arranged in Order of Increasing Wavelength

Wavelength (nm)	Laser dye*	Solvent	Pump	Ref.
460–479	coumarin 6-1-2	benzene(air)	FL(triaxial)	38
460–483	coumarin 6–1–2	benzene(Ar)	FL(triaxial)	38
461 (448-489)	coumarin 460; 1	methanol	FL	25
461–479	coumarin 6-1-2	DEC(air)	FL(triaxial)	38
462	oxazole 4-2-7	H_2O	FL	45
462–483	coumarin 6-1-2	BuOAC(air)	FL(triaxial)	38
462–485	coumarin 6-1-2	DEC(Ar)	FL(triaxial)	38
462–489	oxazole 4-6-1	H_2O/HOAc:95/5	ruby(316)	28
463 (450–480)	benzimidazole 3-1-2	methanol	XeCl	128
463–488	coumarin 6-1-2	BuOAC(Ar)	FL(triaxial)	38
464 (446–492)	coumarin C1H: LD 466	EtOH/p-dioxane	N_2(337)	64
464 (447–510)	triazolstilbene	methanol	N_2(337)	40
464–514	pyrylium dye 13	CH_3CN	N_2(337)	190
465	coumarin C2H	ethanol	FL	191
465 (452–480)	coumarin C1H: LD 466	ethanol	N_2(337)	1
465 (454–480)	benzimidazole 3-1-2	ethanol	XeCl	128
467	coumarin;3,7-substituted	water	N_2(337)	36
467 (459–477)	coumarin C1H: LD 466	ethanol	Nd:YAG(355)	65
467–490	coumarin 6-1-2	glyme(air)	FL(triaxial)	38
467–491	coumarin 6-1-2	THF(Ar)	FL(triaxial)	38
467–497	coumarin 6-1-2	glyme(Ar)	FL(triaxial)	38
468	coumarin 378	water	FL	55
468	pyrylium salt	dichloromethane	N_2(337)	36
468–491	coumarin 6-1-2	THF(air)	FL(triaxial)	38
470	coumarin 360	water	FL	55
470	coumarin 380	water	FL	55
470 (450–495)	coumarin 460; 1	EG	Ar or Kr(uv)	164
470 (460–495)	2-(*o*-hydroxyphenyl/ benzimidazole	dioxane	XeCl(308)	33
470–517	pyrylium dye 15	CH_3CN	N_2(337)	190
471 (448–505)	coumarin 460; 1	—	Kr(uv)	52
472 (446–506)	coumarin 460; 1	EG	Ar(cw)	47
473	coumarin 379	water	FL	55
473 (460–490)	benzimidazole 3-1-2	p-dioxane	XeCl	128
474 (459–489)	benzimidazole 3-1-2	acetonitrile	XeCl	128
474 (462–490)	coumarin C1H: LD 466	methanol+LO	FL	25
475	coumarin 522; C8H	ethanol	FL	37
475	pyrylium salt	dichloromethane	N_2(337)	36
475–500	coumarin 6-1-2	acetone(air)	FL(triaxial)	38

Table 3.1.1
Organic Dye Lasers Arranged in Order of Increasing Wavelength

Wavelength (nm)	Laser dye*	Solvent	Pump	Ref.
475–504	coumarin 6-1-2	acetone(Ar)	FL(triaxial)	38
477	coumarin C4H	ethanol	FL	191
477 (463–495)	benzimidazole 3-1-2	DMF	XeCl	128
477–526	coumarin 6-4-4	ethanol	XeCl	24
478	coumarin 381	water	FL	55
478	coumarin 478; 106	ethanol	FL	66
478	pyrylium salt	dichloromethane	N_2(337)	36
478–525	coumarin 6-4-6	ethanol	XeCl	24
479	coumarin C2F; 485	p-dioxane	FL	66
479–506	coumarin 6-1-2	CH_3CN(Ar)	FL(triaxial)	38
480	coumarin 480; 102	ethanol	FL	61
480	coumarin C1F:CSA-27	ethanol	N_2(337)	44
480–497	oxazole 4-1-8	ethanol(air)	FL	129
480–528	coumarin 6-4-3	ethanol	XeCl	24
481	coumarin C1F:CSA-27	ethanol	FL	61,66
481	coumarin C1F:CSA-27	p-dioxane	FL	66,67
481	coumarin C1F:CSA-27	p-dioxane	KrF(248)	6
481 (460–518)	coumarin C1F:CSA-27	p-dioxane	N_2(337)	56
481 (475–490)	coumarin C1F:CSA-27	p-dioxane	FL	25
482–507	coumarin 515; 30	ethanol	N_2He(428)	68
482–509	oxazole 4-1-8	MeOH(air)	FL	129
482–526	coumarin 6-4-5	ethanol	XeCl	24
483	pyrylium salt	dichloromethane	N_2(337)	36
483 (463–516)	coumarin C1F:CSA-27	p-dioxane	N_2(337)	69
483 (477–489)	coumarin 6-3-1	ethanol(air)	FL(triaxial)	130
483 (478–489)	coumarin 6-3-1	ethanol(Ar)	FL(triaxial)	130
483 (560–517)	coumarin C1F:CSA-27	p-dioxane	N_2(337)	20
484	coumarin C3F:CSA-29	ethanol	FL	66
484–507	coumarin 6-1-2	DMA(Ar)	FL(triaxial)	38
484–512	oxazole 4-1-8	MeOH(Ar)	FL	129
485	coumarin C2F; 485	ethanol	N_2(337)	44
485	coumarin:CSA-10	ethanol+HCl	N_2(337)	44
485	coumarin:CSA-6	ethanol+HCl	N_2(337)	44
485	coumarin:CSA-8	ethanol+HCl	N_2(337)	44
485	coumarin:CSA-9	ethanol+HCl	N_2(337)	44
486	coumarin 6-1-2	2-PrOH(air)	FL(triaxial)	38
486	coumarin 486	water	FL	55
486–508	coumarin 6-1-2	DMF(air)	FL(triaxial)	38
487 (465–510)	benzimidazole 3-1-1	acetonitrile	N_2	128

Table 3.1.1
Organic Dye Lasers Arranged in Order of Increasing Wavelength

Wavelength (nm)	Laser dye*	Solvent	Pump	Ref.
487–503	coumarin 6-1-2	CH_3CN(air)	FL(triaxial)	38
487–506	coumarin 6-1-2	DCE(air)	FL(triaxial)	38
487–511	coumarin 6-1-2	DMA(air)	FL(triaxial)	38
487–512	coumarin 6-1-2	DMF(Ar)	FL(triaxial)	38
488	coumarin C3F:CSA-29	ethanol	FL	70
488	pyrylium salt	dichloromethane	N_2(337)	36
488–511	coumarin 6-1-2	DCE(Ar)	FL(triaxial)	38
489	coumarin 6-1-1	ethanol(air)	FL(triaxial)	38
489	coumarin 6-1-3	ethanol(air)	FL(triaxial)	38
489	coumarin 488	water	FL	55
489	coumarin C1F:CSA-27	p-dioxane	Nd:YAG(355)	60
489 (460–540)	quinoxalinone	ethanol	N_2(337)	71
489 (467–510)	coumarin C3F:CSA-29	methanol	FL	72
489–513	coumarin 6-1-2	NMP(air)	FL(triaxial)	38
489–541	pyrylium dye 44	CH_3CN	N_2(337)	48
490	coumarin C3F:CSA-29	ethanol	FL	61
490	coumarin C6H; LD 490	—	FL	191
490	oxazole 4-2-1	H_2O	FL	45
490–514	oxazole 4-1-8	EtOH/H_2O(air)	FL	129
490–546	pyrylium dye 36	CH_3CN	N_2(337)	48
491	coumarin 6-1-2	ethanol(air)	FL(triaxial)	38
491 (482–509)	imitrine 7-1-131	ethanol	Nd:YAG(355)	133
491–513	coumarin 6-1-2	NMP(Ar)	FL(triaxial)	38
492	coumarin 6-1-3	ethanol(Ar)	FL(triaxial)	38
492	oxazole 4-3-1	MeOH(air)	FL	131
492	pyrylium salt	dichloromethane	N_2(337)	36
492–504	oxazole 4-1-9	ethanol(air)	FL	129
492–507	oxazole 4-1-2	ethanol(air)	FL	129
492–511	oxazole 4-6-5	H_2O/HOAc:95/5	ruby(316)	28
493	coumarin 6-1-1	ethanol(Ar)	FL(triaxial)	38
493	coumarin 6-1-1	methanol(air)	FL(triaxial)	38
493	coumarin 6-1-3	methanol(air)	FL(triaxial)	38
493	oxazole 4-3-1	ethanol(Ar)	FL	131
493 (475–518)	coumarin 6-5-9	ethanol	XeCl	132
493–508	oxazole 4-1-2	ethanol(Ar)	FL	129
493–512	oxazole:4PyPO	water+HCl(pH2)	N_2(337)	32
494	coumarin 6-1-2	methanol(air)	FL(triaxial)	38
494	coumarin 316	water	FL	55
494	oxazole 4-3-1	H_2O(air)	FL	131
494	oxazole 4-3-1	H_2O(Ar)	FL	131

Table 3.1.1
Organic Dye Lasers Arranged in Order of Increasing Wavelength

Wavelength (nm)	Laser dye*	Solvent	Pump	Ref.
494	oxazole 4-3-15	ethanol(air)	FL	131
494	oxazole 4-3-4	methanol(air)	FL	131
494	oxazole 4-3-4	methanol(Ar)	FL	131
494–504	oxazole 4-6-5	ethanol	ruby(316)	28
494–512	oxazole 4-1-1	H_2O(Ar)	FL	129
494–512	oxazole 4-1-2	H_2O(air)	FL	129
494–546	pyrylium dye 46	CH_3CN	N_2(337)	190
495	benzimidazole 3-1-4	p-dioxane	N_2	128
495	coumarin 6-1-2	ethanol(Ar)	FL(triaxial)	38
495	oxazole 4-3-1	EtOH/H_2O(Ar)	FL	131
495	oxazole 4-3-15	ethanol(Ar)	FL	131
495	oxazole 4-3-4	ethanol(Ar)	FL	131
495	oxazole 4-3-4	EtOH/H_2O(Ar)	FL	131
495	oxazole 4-3-4	H_2O(air)	FL	131
495	oxazole 4-3-4	H_2O(Ar)	FL	131
495 (477–515)	coumarin C3F:CSA-29	methanol+LO	FL	25
495–511	oxazole 4-1-2	EtOH/H_2O(Ar)	FL	129
495–514	oxazole:4PyPO-TS	water	N_2(337)	32
496	coumarin C3F:CSA-29	EtOH/H_2O	FL	66
496	oxazole 4-2-1	H_2O	ruby(347)	45
496	oxazole 4-3-1	EtOH/H_2O(air)	FL	131
496	oxazole 4-3-4	EG/H_2O(Ar)	FL	131
496	oxazole 4-3-4	MeOH/H_2O(air)	FL	131
496	oxazole 4-3-8	ethanol(air)	FL	131
496 (484–508)	coumarin 6-3-1	EtOH/H_2O(Ar)	FL(triaxial)	130
496–507	oxazole 4-1-2	EtOH/H_2O(air)	FL	129
496–508	oxazole 4-1-9	MeOH(air)	FL	129
497	coumarin 6-1-1	EG/EtOH(air)	FL(triaxial)	38
497	coumarin 6-1-1	MeOH/H_2O(air)	FL(triaxial)	38
497	coumarin 6-1-3	MeOH(Ar)	FL(triaxial)	38
497	pyrylium salt	dichloromethane	N_2(337)	36
497 (485–508)	coumarin 6-3-1	EtOH/H_2O(air)	FL(triaxial)	130
498	coumarin 6-1-3	EG/EtOH(air)	FL(triaxial)	38
498	coumarin 6-1-3	EG/EtOH(Ar)	FL(triaxial)	38
498	coumarin 6-1-3	MeOH/H_2O(air)	FL(triaxial)	38
498	oxazole 4-3-4	EG/H_2O(Ar)	FL	131
498	oxazole 4-3-4	MeOH/H_2O(Ar)	FL	131
498 (477–531)	coumarin 503; 307	ethanol	FL	25
498–518	oxazole 4-6-6	H_2O	ruby(316)	28

Table 3.1.1
Organic Dye Lasers Arranged in Order of Increasing Wavelength

Wavelength (nm)	Laser dye*	Solvent	Pump	Ref.
499	coumarin 6-1-2	EG/EtOH(air)	FL(triaxial)	38
499	coumarin 6-1-2	MeOH/H_2O(air)	FL(triaxial)	38
499	oxazole 4-3-8	ethanol(Ar)	FL	131
499 (484–537)	coumarin 504; 314	methanol+LO	FL	25
499–514	oxazole 4-6-6	ethanol	ruby(316)	28
499–547	pyrylium dye 45	CH_3CN	N_2(337)	190
499 (492–507)	coumarin 6-3-5	Ethanol(Ar)	FL(triaxial)	130
500	coumarin 6-1-2	EG/EtOH(Ar)	FL(triaxial)	38
500	coumarin CSA-28; 500	ethanol	KrF(248)	3
500	coumarin CSA-28; 500	ethanol	N_2(337)	44
500 (473–547)	coumarin CSA-28; 500	ethanol	N_2(337)	20
500 (482–517)	coumarin C2F; 485	p-dioxane	N_2(337)	73
500 (492–508)	coumarin 6-3-5	ethanol(air)	FL(triaxial)	130
500 (494–504)	coumarin CSA-28; 500	ethanol	Nd:YAG(355)	65
500–546	coumarin 6-4-8	ethanol	XeCl	24
500–562	pyrylium dye 18	CH_3CN	N_2(337)	190
501	bimane 5-1-1	HFIP	FL	134
501	coumarin 6-1-1	EtOH/H_2O(air)	FL(triaxial)	38
501	coumarin 6-1-1	EtOH/H_2O(Ar)	FL(triaxial)	38
501	coumarin 6-1-3	EtOH/H_2O(air)	FL(triaxial)	38
501	oxazole 4-2-3	H_2O	FL	45
501	oxazole 4-3-20	ethanol(Ar)	FL	131
501	pyrylium salt	dichloromethane	N_2(337)	36
501 (490–513)	coumarin 519; 334	methanol	FL	25
501 (493–508)	coumarin 6-3-7	ethanol(air)	FL(triaxial)	130
501–550	coumarin 6-4-7	ethanol	XeCl	24
501–563	pyrylium dye 17	CH_3CN	N_2(337)	190
502	coumarin 6-1-2	EtOH/H_2O(air)	FL(triaxial)	38
502	coumarin 6-1-2	MeOH(Ar)	FL(triaxial)	38
502	coumarin 6-1-3	EtOH/H_2O(Ar)	FL(triaxial)	38
502	coumarin 6-1-4	MeOH/H_2O	F	135
502	coumarin 503; 307	ethanol	FL	61
502	coumarin;3,7-substituted	methanol	N_2(337)	36
502	oxazole 4-3-20	ethanol(air)	FL	131
502	oxazole 4-3-21	ethanol(air)	FL	131
502	oxazole 4-3-21	ethanol(Ar)	FL	131
502	phosphorine	benzene	N_2(337)	36
502 (474–556)	quinoxalinone	ethanol	N_2(337)	71
502 (494–510)	coumarin 6-3-7	ethanol(Ar)	FL(triaxial)	130

Table 3.1.1
Organic Dye Lasers Arranged in Order of Increasing Wavelength

Wavelength (nm)	Laser dye*	Solvent	Pump	Ref.
503	coumarin 6-1-2	EtOH/H_2O(Ar)	FL(triaxial)	38
503	coumarin 6-1-4	MeOH(air)	FL(triaxial)	38
503	oxazole 4-2-3	H_2O	ruby(347)	45
503	oxazole 4-2-5	H_2O	ruby(347)	45
503	oxazole 4-2-7	H_2O	ruby(347)	45
503	oxazole 4-3-21	EtOH/H_2O(air)	FL	131
503	oxazole 4-3-21	EtOH/H_2O(Ar)	FL	131
503	oxazole 4-3-21	H_2O(air)	FL	131
503	oxazole 4-3-21	H_2O(Ar)	FL	131
503–521	oxazole 4-6-2	ethanol	ruby(316)	28
503–557	pyrylium dye 34	CH_3CN	N_2(337)	190
504	coumarin 6-1-3	MeOH/H_2O(Ar)	FL(triaxial)	38
504	coumarin 504; 314	ethanol	FL	61
504	oxazole 4-2-2	H_2O	FL	45
504	oxazole 4-2-4	H_2O	ruby(347)	45
504	oxazole:4PyPO	water+HCl(pH2)	FL	32
504 (481–530)	coumarin 503; 307	MeOH+LO	FL	25
504 (498–511)	coumarin 6-3-6	ethanol(air)	FL(triaxial)	130
505	coumarin 6-1-2	MeOH/H_2O(Ar)	FL(triaxial)	38
505	pyrylium salt	dichloromethane	N_2(337)	36
505 (495–515)	coumarin 515; 30	aq.,DPA,COT	Ar(cw,458)	192
505 (495–517)	coumarin 504; 314	MeOH/H_2O:1/1	FL	26
505 (498–512)	coumarin 6-3-6	ethanol(Ar)	FL(triaxial)	130
506	oxazole 4-2-6	H_2O	ruby(347)	45
506	oxazole:4PyPO-TS	water	FL	32
507	bimane 5-1-3	HFIP/H_2O:4/1	FL	50
507	coumarin 540A; 153	p-dioxane	N_2(337)	69
507 (481–540)	coumarin 481; CSA-27	dioxane/ethanol	N_2(337)	69
507 (490–537)	imitrine 7-1-124	ethanol	Nd:YAG(355)	133
507–529	coumarin 540; 6	ethanol	N_2He(428)	68
508	coumarin;3,4,7-subst.	methanol	N_2(337)	36
508	oxazole 4-2-2	H_2O	ruby(347)	45
508	oxazole 4-3-5	EtOH(Ar)	FL	131
508	pyrylium salt	dichloromethane	N_2(337)	36
508 (477–548)	coumarin 515; 30	—	Kr(violet)	52
508 (481–573)	coumarin CSA-28; 500	methanol	Nd:YAG(355)	53
508 (490–521)	imitrine 7-1-133	ethanol	Nd:YAG(355)	133
508–588	coumarin 6-4-10	ethanol	XeCl	24
509–531	oxazole 4-6-8	H_2O/HOAc:95/5	ruby(316)	28

Table 3.1.1
Organic Dye Lasers Arranged in Order of Increasing Wavelength

Wavelength (nm)	Laser dye*	Solvent	Pump	Ref.
510	oxazole 4-3-5	H_2O(Ar)	FL	131
510 (478–570)	quinoxalinone	ethanol	N_2(337)	71
510 (492–550)	coumarin 515; 30	EG	Ar(458)	48
510–522	oxazole 4-6-7	ethanol	ruby(316)	28
510–527	oxazole 4-6-7	H_2O	ruby(316)	28
510–535	coumarin 6-8-1	p-dioxane	Nd:YAG	136
511 (483–556)	quinoxalinone	ethanol	N_2(337)	71
511 (504–518)	coumarin 6-3-9	ethanol(air)	FL(triaxial)	130
512	coumarin 6-1-4	EtOH/H_2O(air)	FL(triaxial)	38
512	pyrylium salt	dichloromethane	N_2(337)	36
512 (504–519)	coumarin 6-3-9	ethanol(Ar)	FL(triaxial)	130
512 (505–518)	coumarin 6-3-8	ethanol(air)	FL(triaxial)	130
512 (507–517)	coumarin 6-3-8	ethanol(Ar)	FL(triaxial)	130
512–585	coumarin 6-4-9	ethanol	XeCl	24
513	coumarin C4F; 340	ethanol	FL	61
513	oxazole 4-3-14	H_2O(air)	FL	131
513	thiapyrylium salt	dichloromethane	N_2(337)	36
513 (504–523)	coumarin 6-3-5	EtOH/H_2O(Ar)	FL(triaxial)	130
513 (505–520)	coumarin 6-3-6	EtOH/H_2O(air)	FL(triaxial)	130
514	bimane 5-1-4	H_2O	FL	50
514	coumarin 217	water	FL	55
514	oxazole 4-3-14	EtOH/H_2O(air)	FL	131
514	oxazole 4-3-14	H_2O(Ar)	FL	131
514 (482–552)	coumarin CSA-28; 500	methanol	Nd:YAG(355)	51
514 (505–523)	coumarin 6-3-6	EtOH/H_2O(Ar)	FL(triaxial)	130
514 (505–524)	coumarin 6-3-5	EtOH/H_2O(air)	FL(triaxial)	130
514 (505–524)	coumarin 6-3-7	EtOH/H_2O(air)	FL(triaxial)	130
515	coumarin 6-1-4	MeOH/H_2O(air)	FL(triaxial)	38
515	oxazole 4-3-14	ethanol(air)	FL	131
515	pyrylium salt	dichloromethane	N_2(337)	36
515 (492–545)	coumarin C1F:CSA-27	ethanol	N_2(337)	69
515 (495–545)	coumarin 515; 30	EG	Kr(400-420)	164
515 (502–531)	imitrine 7-1-138	ethanol	Nd:YAG(355)	133
515 (505–535)	imitrine 7-1-132	ethanol	Nd:YAG(355)	133
516	2-pyrazoline	methanol	N_2(337)	36
516	bimane 5-1-2	TFE	FL	137
516	oxazole 4-3-14	EtOH/H_2O(Ar)	FL	131
516 (490–566)	coumarin C1F:CSA-27	ethanol	N_2(337)	56
516 (511–522)	coumarin 6-3-10	ethanol(air)	FL(triaxial)	130
516–550	pyrylium dye 7	CH_3CN	N_2(337)	190

Table 3.1.1
Organic Dye Lasers Arranged in Order of Increasing Wavelength

Wavelength (nm)	Laser dye*	Solvent	Pump	Ref.
516–550	pyrylium dye 37	CH_3CN	N_2(337)	190
517 (512–521)	coumarin 6-3-10	ethanol(Ar)	FL(triaxial)	130
518	coumarin 521; 334	water	FL	55
518 (497–547)	coumarin 6-5-1	1,2-DCE	XeCl	132
519	coumarin 217523; 337	ethanol	FL	75
519	coumarin C2F; 485	ethanol	FL	66,70
519	oxazole 4-3-13	EtOH/H_2O(Ar)	FL	131
520	benzoxazinone 8-1-3	ethanol	N_2(337)	68
520	coumarin C2F; 485	ethanol	FL	61
520	oxazole 4-3-13	ethanol(Ar)	FL	131
520	oxazole 4-3-13	H_2O(air)	FL	131
520 (490–562)	coumarin C2F; 485	ethanol	N_2(337)	44
520 (498–556)	coumarin C8F; 522	ethanol	FL	25
520 (506–544)	coumarin 504; 314	MeOH/H_2O:1/1	FL	19
520 (509–537)	benzimidazole 3-1-5	cyclohexane/p	N_2	128
520 (513–527)	coumarin 6-3-9	EtOH/H_2O(air)	FL(triaxial)	130
520 (513–528)	coumarin 6-3-9	EtOH/H_2O(Ar)	FL(triaxial)	130
520–600	fluorescein	ethanol, w, t	N_2(337)	27
521	coumarin 540A, 153	ethanol	FL	61
522	coumarin 355	ethanol	FL	61
522	coumarin 540A, 153	ethanol	FL	61
522	coumarin C340	ethanol	FL	66
522	oxazole 4-3-13	EtOH/H_2O(air)	FL	131
522	oxazole 4-3-14	ethanol(Ar)	FL	131
522	phosphorine	benzene	N_2(337)	36
522	pteridine	water, alkaline	N_2(337)	10
522	pyrylium salt	dichloromethane	N_2(337)	36
522 (500–548)	coumarin CSA-28; 500	MeOH/H_2O:1/1	FL	26
522 (500–572)	coumarin C8F; 522	ethanol	FL	66
522 (518–525)	coumarin 6-3-8	EtOH/H_2O(Ar)	FL(triaxial)	130
522 (537–580)	disodium fluorescein	EG,COT	Ar	47
523	coumarin C2F; 485	methanol	FL	25
523	oxazole 4-3-13	H_2O(Ar)	FL	131
524	oxazole 4-3-13	ethanol(Ar)	FL	131
524	pyrylium salt	dichloromethane	N_2(337)	36
524 (475–542)	benzimidazole 3-1-3	DMF	N_2	128
524 (507–540)	benzimidazole 3-1-3	acetonitrile	N_2	128
524 (509–542)	benzimidazole 3-1-3	cyclohexane/p	N_2	128
524 (515–549)	benzimidazole 3-1-3	p-dioxane	N_2	128

Table 3.1.1
Organic Dye Lasers Arranged in Order of Increasing Wavelength

Wavelength (nm)	Laser dye*	Solvent	Pump	Ref.
525	bimane 5-1-5	H_2O	FL	50
525 (500–575)	coumarin 535; 7	DPA+LO,COT	Ar(cw,477)	192
525 (502–573)	coumarin C2F; 485	methanol	Nd:YAG(355)	53
526	pyrylium salt	dichloromethane	N_2(337)	36
526 (501–568)	coumarin C8F; 522	methanol+LO	FL	25
526 (520–530)	coumarin 6-3-10	EtOH/H_2O(Ar)	FL(triaxial)	130
526–596	pyrylium dye 22	CH_3CN	N_2(337)	190
527	coumarin CSA-25	ethanol	N_2(337)	44
527	oxazole 4-3-16	EtOH(Ar)	FL	131
527	pyrylium salt	dichloromethane	N_2(337)	36
528	coumarin 6-7-5	p-dioxane	N_2	139
528 (520–536)	coumarin 6-3-8	EtOH/H_2O(air)	FL(triaxial)	130
529	phosphorine	benzene	N_2(337)	36
529 (511–559)	coumarin 6-5-3	1,2-DCE	XeCl	132
529–536	oxazole 4-6-8	ethanol	ruby(316)	28
530 (514–552)	benzimidazole 3-1-5	p-dioxane	N_2	128
530–570	coumarin 6-8-1	EtOH+HOAc	N_2	136
531	coumarin 531	ethanol	N_2(337)	44
531 (510–556)	coumarin 540; 6	methanol	FL	25
532	coumarin CSA-24	ethanol	N_2(337)	44
532	pyrylium salt	dichloromethane	N_2(337)	36
532–550	coumarin 6–7–5	DMF+HOAc	N_2	139
532-609	pyrylium dye 16	CH_3CN	N_2(337)	190
532–622	pyrylium dye 20	CH_3CN	N_2(337)	190
533	pyrromethene-BF_2 9-1-1	MeOH	FL	141,142
533 (510–558)	coumarin 6-5-2	1,2-DCE	XeCl	132
533 (515–570)	coumarin C8F; 522	DMF+MeOH	FL	19
533 (525–541)	coumarin 6-3-4	ethanol(air)	FL(triaxial)	130
534	pyrylium salt	dichloromethane	N_2(337)	36
534 (525–543)	coumarin 6-3-4	ethanol(Ar)	FL(triaxial)	130
534 (526–541)	coumarin 6-3-2	ethanol(air)	FL(triaxial)	130
535 (500–565)	coumarin 535; 7	EG	Ar(477)	164
535 (505–565)	coumarin 535; 7	EG	Kr(400-420)	164
535 (512–562)	coumarin 6-5-10	ethanol	XeCl	132
536	phosphorine	benzene	N_2(337)	36
536 (515–557)	imitrine 7-1-142	ethanol	Nd:YAG(355)	133
536 (515–583)	coumarin 540A; 153	ethanol	FL	25
536 (517–576)	coumarin 540A; 153	ethanol	N_2(337)	20
536 (522–546)	imitrine 7-1-130	ethanol	Nd:YAG(355)	133

Table 3.1.1
Organic Dye Lasers Arranged in Order of Increasing Wavelength

Wavelength (nm)	Laser dye*	Solvent	Pump	Ref.
536 (522–548)	imitrine 7-1-125	ethanol	Nd:YAG(355)	133
536 (526–546)	imitrine 7-1-136	ethanol	Nd:YAG(355)	133
537	oxazole 4-3-17	ethanol(Ar)	FL	131
537	oxazole 4-3-17	EtOH/H_2O(Ar)	FL	131
537 (531–544)	coumarin 6-3-2	ethanol(Ar)	FL(triaxial)	130
537–623	pyrylium dye 32	CH_3CN	N_2(337)	190
538	coumarin 540A; 153	ethanol	FL	66
538 (521–551)	coumarin 540; 6	methanol	FL	59
538–620	pyrylium dye 21	CH_3CN	N_2(337)	190
539	oxazole 4-3-17	ethanol(Ar)	FL	131
539 (530–548)	coumarin 6-3-2	EtOH/H_2O(Ar)	FL(triaxial)	130
540	bimane 5-1-1	H_2O	FL	134
540	coumarin 540A, 153	ethanol	FL	61
540 (515–566)	coumarin 540; 6	EG	Ar(cw)	47
540 (515–585)	coumarin 540; 6	DPA+LO,COT	Ar(488)	76
540 (516–590)	coumarin 540A; 153	methanol	Nd:YAG(355)	51
540 (521–559)	imitrine 7-1-141	ethanol	Nd:YAG(355)	133
540 (537–560)	pyrromethene 567	DMA/MeOH	FL (coaxial)	142
540 (523–557)	imitrine 7-1-135	ethanol	Nd:YAG(355)	133
541	oxazole 4-3-17	ethanol(Ar)	FL	131
541 (520–586)	coumarin 540A; 153	methanol	FL	25
541 (532–549)	coumarin 6-3-10	EtOH/H_2O(air)	FL(triaxial)	130
542 (520–570)	coumarin 6-5-4	1,2-DCE	XeCl	132
542 (523–580)	pyrromethene 546	methanol	FL (triaxial)	143,144
542 (530–554)	imitrine 7-1-123	ethanol	Nd:YAG(355)	133
542 (532–565)	pyrromethene 546	DMA/MeOH	FL (coaxial)	142
542–630	pyrylium dye 19	CH_3CN	N_2(337)	190
543	benzoxazinone 8-1-1	ethanol	N_2(337)	138
543	coumarin 540A; 153	ethanol	FL	70
543–550	coumarin 6-7-5	p-dioxane+HOAc	N_2	139
544	2-pyrazoline	methanol alkaline	N_2(337)	36
544	oxazole 4-3-3	ethanol(air)	FL	131
544 (526–570)	coumarin 540; 6	methanol	FL	26
544 (536–552)	imitrine 7-1-139	ethanol	Nd:YAG(355)	133
545	oxazole 4-3-3	ethanol(Ar)	FL	131
545	pyrylium salt	dichloromethane	N_2(337)	36
545 (537–553)	coumarin 6-3-4	EtOH/H_2O(air)	FL(triaxial)	130

Table 3.1.1
Organic Dye Lasers Arranged in Order of Increasing Wavelength

Wavelength (nm)	Laser dye*	Solvent	Pump	Ref.
545 (537–553)	coumarin 6-3-4	$EtOH/H_2O$(Ar)	FL(triaxial)	130
546	pyrromethene-BF_2	ethanol	FL	141
546 (527–583)	pyrromethene 556	EG	Ar (488)	145
546 (536–556)	imitrine 7-1-137	ethanol	Nd:YAG(355)	133
546 (bb)	pyrromethene 546	ethanol	FL	189
547 (523–582)	pyrromethene 556	EG	Ar (699-1488)	23
547 (540–555)	coumarin 6-3-3	ethanol(Ar)	FL(triaxial)	130
547 (541–554)	coumarin 6-3-3	ethanol(air)	FL(triaxial)	130
548 (537–605)	pyrromethene 556	methanol	FL (triaxial)	143
548 (542–554)	coumarin 6-3-2	$EtOH/H_2O$(air)	FL(triaxial)	130
548–652	dibenzoxanthylium	TFE	Cu	121
549–630	pyrylium dye 39	CH_3CN	N_2(337)	190
550	pyrylium salt	dichloromethane	N_2(337)	36
550	Rhodamine 6G; 590	methanol	Nd:YAG(532)	65
550 (527–584)	pyrromethene 556	EG	Ar (514.5)	145
550–580	coumarin 6-8-2	p-dioxane	Nd:YAG	136
550–580	fluorol 555; 7GA	—	FL	77
551	pyrromethene-BF_2 9-1-3	methanol	FL	141
551 (545–559)	xanthene 10-1-2	H_2OMeOH:1/2	Nd:YAG(532)	147
552	fluorol 555; 7GA	MeOH/LO	FL	78
552 (536–602)	rhod. 560 chloride; 110	EG	Ar(cw)	47
552 (538–573)	disodium fluorescein	EG	Ar(458,514)	164
552 (543–562)	coumarin 6-3-3	$EtOH/H_2O$(Ar)	FL(triaxial)	130
552 (545–586)	pyrromethene 580	methanol	Nd:YAG(532)	122
552 (545–585)	pyrromethene 580	ethanol	Nd:YAG (532)	148
553 (530–624)	pyrromethene 556	EG	Ar (458-514)	149
553–655	pyrylium dye 47	CH_3CN	N_2(337)	190
554	benzoxazinone 8-1-6	ethanol	N_2(337)	138
555	fluorol 555; 7GA	alcohol or water	FL	69
555 (545–585)	pyrromethene 556	DMA/MeOH	FL (coaxial)	142
555 (547–564)	coumarin 6-3-3	$EtOH/H_2O$(air)	FL(triaxial)	130
556	pyrromethene-BF_2(5)	methanol	FL	123
556–623	pyrylium dye 41	CH_3CN	N_2(337)	190
556–629	pyrylium dye 40	CH_3CN	N_2(337)	190
558–603	pyrylium dye 43	CH_3CN	N_2(337)	190
558–632	pyrylium dye 35	CH_3CN	N_2(337)	190
559	oxazole 4-3-11	ethanol(air)	FL	131
559	oxazole 4-3-2	2-PrOH	FL	131
559	pyrromethene-BF_2(6)	ethanol	FL	123

Table 3.1.1
Organic Dye Lasers Arranged in Order of Increasing Wavelength

Wavelength (nm)	Laser dye*	Solvent	Pump	Ref.
559 (548–588)	xanthene 10-1-1	H_2OMeOH:1/2	Nd:YAG(532)	147
559–582	oxazole 4-1-3	2-PrOH(Ar)	FL	129
560	coumarin 6-7-5	DMF+HOAc	N_2	139
560	pyrylium salt	dichloromethane	N_2(337)	36
560	rhodamine 560 chloride	ethanol	FL	80
560 (510–570)	coumarin 540; 6	EG/bz alcohol	Ar(488)	76
560 (530–623)	pyrromethene 556(9-1-3)	EG	Ar(458-524,cw)	124
560 (543–584)	pyrromethene 567	PPH	Ar (514.5)	145
560 (548–580)	rhodamine 6G; 590	methanol	Nd:YAG(532)	53
560 (551–570)	xanthene 10-1-3	H_2OMeOH:1/2	Nd:YAG(532)	147
560–583	oxazole 4-1-3	ethanol	FL	129
560–598	oxazole 4-6-12	ethanol	ruby(316)	28
561 (540–580)	pyrromethene 556	methanol	FL	144-46
562 (508–573	brilliant sulfaflavine	COT	FL	81,82
562 (520–575)	coumarin 540A; 153	ethanol	Ar(476)	76
562 (522–618)	brilliant sulfaflavine	methanol	FL	26
562 (546–592)	rhodamine 6G; 590	methanol	Nd:YAG(532)	83
562–595	oxazole 4-6-4	H_2O/HOAc:4/6	ruby(316)	28
563	benzoxazinone 8-1-2	ethanol	N_2(337)	138
563 (541–583)	rhodamine 560 chloride	methanol	FL	26
563 (550–590)	rhodamine 6G; 590	methanol	Nd:YAG(532)	84
563–580	xanthene 10-1-6	H_2OMeOH:1/2	Nd:YAG(532)	147
563–600	oxazole 4-6-12	H_2O	ruby(316)	28
564	rhodamine 6G; 590	methanol	Nd:YAG(532)	51
564–633	pyrylium dye 48	CH_3CN	N_2(337)	190
565	oxazole 4-5-9	methanol	FL(coaxial)	150
565 (544–589)	rhodamine 560 chloride	methanol	FL	25
565 (550–595)	Pyrromethene 567	PPH	Nd:YAG(532)	122
565 (551–579)	imitrine 7-1-127	DEE	Nd:YAG(355)	133
565–610	coumarin 6-8-2	EtOH+HOAc	N_2	136
565–620	Rhodamine 6G	ethanol, w, t	N_2(337)	27
566	benzoxazinone 8-1-5	ethanol	N_2(337)	138
566	oxazole 4-3-11	ethanol(Ar)	FL	131
566	pyrromethene-BF_2(3)	ethanol	FL	123
566 (549–592)	pyrromethene 567	PPH	Nd:YAG (532)	122
567	oxazole 4-3-2	ethanol(Ar)	FL	131
567	pyrromethene 567	ethanol	FL	123
567	pyrromethene-BF_2(4)	methanol	FL	123

Table 3.1.1
Organic Dye Lasers Arranged in Order of Increasing Wavelength

Wavelength (nm)	Laser dye*	Solvent	Pump	Ref.
567 (546–587)	rhodamine 560 chloride	ethanol	FL	25
567–587	oxazole 4-1-3	ethanol(Ar)	FL	129
568	oxazole 4-5-8	MeOH	FL(coaxial)	150
568 (550–608)	pyrromethene 567	PPH	Ar(458-524,cw)	124
568 (559–580)	xanthene 10-1-4	H_2O/MeOH:1/2	Nd:YAG(532)	70
568–598	oxazole 4-6-11	H_2O	ruby(316)	28
568–598	oxazole 4-6-11	H_2O/HOAc:1/1	ruby(316)	28
568–598	oxazole 4-6-11	H_2O/HOAc:95/5	ruby(316)	28
569	oxazole 4-5-1	methanol	FL(coaxial)	150
569	oxazole 4-5-2	methanol	FL(coaxial)	150
569	oxazole 4-5-3	methanol	FL(coaxial)	150
569	oxazole 4-5-4	methanol	FL(coaxial)	150
569	oxazole 4-5-5	methanol	FL(coaxial)	150
569 (533–600)	rhodamine 560 chloride	—	Kr(blue/green)	52
569 (545–583)	pyrromethene 580	ethanol	Nd:YAG (532)	148
570	benzoxazinone 8-1-4	ethanol	N_2(337)	68
570	oxazole 4-3-2	EtOH/H_2O(air)	FL	131
570	pyrromethene 567	methanol	FL	144
570	rhodamine 560 chloride	ethanol	FL	80
570 (540–590)	fluorol 555; 7GA	ethanol	FL	25
570 (540–600)	rhodamine 560 chloride	EG	Ar(458,514)	164
570 (553–587)	imitrine 7-1-127	ethanol	Nd:YAG(355)	133
570 (bb)	pyrromethene 580	ethanol	Nd:YAG (532)	153
570–600	oxazole 4-6-13	H_2O	ruby(316)	28
571	oxazole 4-3-2	ethanol(Ar)	FL	131
571	pyrromethene 597	ethanol	Nd:YAG (532)	148
571	pyrromethene-BF_2(2)	ethanol	FL	125
571 (552–608)	pyrromethene 567	NMP/PPH	Ar (all lines)	149
571 (560–600)	Pyrromethene 597	ethanol	Nd:YAG(532)	122
571–588	oxazole 4-1-3	methanol(Ar)	FL	129
571–591	oxazole 4-1-3	H_2O(Ar)	FL	129
572	oxazole 4-5-7	MeOH	FL(coaxial)	150
572 (560–584)	imitrine 7-1-134	ethanol	Nd:YAG(355)	133
572 (564–600)	rhodamine 6G; 590	ethanol	Cu(511,578)	85
573	oxazole 4-3-22	ethanol(air)	FL	131
573	oxazole 4-5-6	methanol	FL(coaxial)	150
573–682	dibenzoxanthylium	CH_3CN	Cu	121
574	oxazole 4-3-22	ethanol(Ar)	FL	131
574	xanthene 10-1-5	H_2OMeOH:1/2	Nd:YAG(532)	147

Table 3.1.1
Organic Dye Lasers Arranged in Order of Increasing Wavelength

Wavelength (nm)	Laser dye*	Solvent	Pump	Ref.
574 (535–590)	fluorol 555; 7GA	methanol	FL	77
574 (542–592)	fluorol 555; 7GA	methanol	FL	25
575	rhodamine 575	ethanol	FL	80
575 (555–592)	pyrromethene 580	PPH	Ar (all lines)	154
575 (569–585)	perylene 11-1-1	DMF	Nd:YAG(532)	155
576 (550–592)	imitrine 7-1-129	ethanol	Nd:YAG(355)	133
576 (555–618)	rhodamine 6G; 590	ethanol	N_2(337)	86
577 (563–602)	rhodamine 575	ethanol	FL	25
577 (566–600)	perylene BASF-241	chloroform	Nd:YAG(532)	156
578	oxazole 4-5-9	H_2O	FL(coaxial)	150
578 (565–612)	rhodamine 6G; 590	methanol	FL	25
579	oxazole 4-3-12	ethanol(Ar)	FL	131
579 (568–605)	rhodamine 6G; 590	ethanol	N_2(337)	20
579 (570–596)	rhodamine B; 610	—	Nd:YAG(532)	83
580	oxazole 4-5-8	H_2O	FL(coaxial)	150
580	rrhodamine 6G; 590	ethanol	KrF(248)	3
580 (bb)	pyrromethene 580	ethanol	FL	157
581	oxazole 4-5-1	methanol	FL(coaxial)	150
581	oxazole 4-5-7	H_2O	FL(coaxial)	150
581–598	oxazole 4-6-13	ethanol	ruby(316)	28
582	oxazole 4-3-12	EtOH/H_2O(Ar)	FL	131
582	oxazole 4-3-12	H_2O(Ar)	FL	131
582	oxazole 4-5-6	H_2O	FL(coaxial)	150
582 (561–593)	imitrine 7-1-128	ethanol	Nd:YAG(355)	133
583 (570–604)	Kiton Red 620; sulforhodamine B	methanol	Nd:YAG(532)	53
584 (570–618)	rhodamine 6G; 590	ethanol	FL	25
585	rhodamine 575	ethanol	FL	80
586 (563–625)	rhodamine 6G; 590	methanol	FL	59
586 (570–606)	rhodamine B; 610	—	Nd:YAG(532)	53
587 (579–601)	rhodamine B; 610	methanol	Nd:YAG(532)	65
587 (bb)	pyrromethene 597	ethanol	Nd:YAG (532)	153
590	rhodamine 6G; 590	methanol	FL	62
590	rhodamine 6G; 590	p-dioxane	KrF(248)	36
590 (566–610)	rhodamine 575	MeOH/H_2O	FL	19
590 (570–650)	rhodamine 6G; 590	EG	Ar(458,514)	164
590 (578–610)	rhodamine B; 610	—	Nd:YAG(532)	84
590–614	oxazole 4-6-9	H_2O/HOAc:1/1	ruby(316)	28
590–614	oxazole 4-6-9	H_2O/HOAc:95/5	ruby(316)	28

Table 3.1.1
Organic Dye Lasers Arranged in Order of Increasing Wavelength

Wavelength (nm)	Laser dye*	Solvent	Pump	Ref.
590–620	oxazole 4-6-10	H_2O/HOAc:1/1	ruby(316)	28
590–620	oxazole 4-6-10	H_2O/HOAc:95/5	ruby(316)	28
590–625	oxazole 4-6-3	ethanol	ruby(316)	28
590–640	sulfohodamine 640; 101	ethanol	Nd:YAG(532)	29
590–616	coumarin 6-9-1	ethanol	L(520)	158
591 (582–618)	rhodamine B; 610	TFE	Cu(511,578)	85
591–614	oxazole 4-6-10	H_2O	ruby(316)	28
592 (578–629)	rhodamine B; 610	methanol	Nd:YAG(532)	51
593	oxazole 4-3-7	ethanol(Ar)	FL	131
593	pyrromethene-BF_2(3)	ethanol	FL	125
593 (bb)	pyrromethene 597	p-dioxane	FL	159
594–612	oxazole 4-6-9	H_2O	ruby(316)	28
595–617	coumarin 6-9-1	ethanol	L(520)	158
596 (577–614)	rhodamine 6G; 590	MeOH/H_2O:1/3	FL	26
597	oxazole 4-3-9	ethanol(Ar)	FL	131
597 (bb)	pyrromethene 597	ethanol	FL	157
~598	MEH-PPV	xyl./chloroform	Nd:YAG(532)	126
598 (577–625)	rhodamine 6G; 590	MeOH/H_2O:1/1	FL	19
599–635	ASPI	ethanol	Nd:YAG(532)	33
600	rhodamine 6G; 590	4%LO/H_2O	FL	62
600 (567–657)	rhodamine 6G; 590	EG	Ar(cw)	47
600–700	DCM-OH	methanol	FL	127
601	thiapyrylium salt	dichloromethane	N_2(337)	36
602	pyrromethene-BF_2(4)	ethanol	FL	125
602 (560–654)	rhodamine 6G; 590	—	Kr(blue/green)	53
602 (589–623)	rh. 640 perchlorate: 101	—	Nd:YAG(532)	83
602 (592–624)	rh. 640 perchlorate: 101	methanol	Nd:YAG(532)	53
603 (580–670)	coumarin 6-5-5	1,2-DCE	XeCl	132
605	coumarin 6-9-2	methanol	L(520)	158
605 (bb)	pyrromethene 605	ethanol	FL	157
607	coumarin 6-9-2	CH_3CN	L(520)	158
608	coumarin 6-9-2	ethanol	L(520)	158
609	coumarin 6-9-1	benzene	L(520)	158
609 (594–643)	rhodamine B; 610	—	N_2(337)	20
610 (585–633)	rhodamine 6G; 590	4%LO/H_2O	FL	19
610 (596–632)	coumarin 6-5-7	1,2-DCE	XeCl	132
610–695	DCM-OH	methanol/H_2O	FL	127
611	rh. 640 perchlorate; 101	methanol	Nd:YAG(532)	65
612	coumarin 6-9-1	CH_3CN	L(520)	158
612	pyrromethene-BF_2(5)	ethanol	FL	125

Table 3.1.1
Organic Dye Lasers Arranged in Order of Increasing Wavelength

Wavelength (nm)	Laser dye*	Solvent	Pump	Ref.
612	thiapyrylium salt	dichloromethane	N_2(337)	36
612 (598–640)	rh. 640 perchlorate; 101	—	Nd:YAG(532)	84
612 (604–630)	pyrromethene 650	—	Nd:YAG (532)	160
612 (606–618)	imitrine 7-1-140	ethanol	Nd:YAG(355)	133
613 (596–645)	rhodamine B; 610	methanol	FL	25
613 (602–657)	rh. 640 perchlorate; 101	methanol	Nd:YAG(532)	51
615–628	coumarin 6-9-1	ethanol	FL	158
617 (595–639)	Kiton Red 620; sulforhodamine B	TFE	Cu(511,578)	85
617 (598–647)	rhodamine B; 610	ethanol	FL	87
618	thiapyrylium salt	dichloromethane	N_2(337)	36
620	coumarin 6-9-1	EtOH+HCl	L(520)	158
620	Kiton Red 620; sulforhodamine B	methanol	FL	88
620 (580–630)	Kiton Red 620; sulforhodamine B	ethanol	FL	87
620 (596–647)	rhodamine B; 610	ethanol	FL	25
621 (608–634)	Kiton Red 620; sulforhodamine B	methanol+COT	FL	26
623	pyrylium salt	dichloromethane	N_2(337)	36
623 (598–649)	Kiton Red 620; sulforhodamine B	ethanol+COT	FL	25
626	coumarin 6-9-2	benzene	L(520)	158
627	pyrylium salt	dichloromethane	N_2(337)	36
627 (595–629)	Kiton Red 620; sulforhodamine B	methanol+COT	FL	25
628 (603–647)	Kiton Red 620; sulforhodamine B	TFE	N_2(337)	86
630	rhodamine 640 perchlorate; 101	ethanol	FL	80
630 (601–675)	rhodamine B; 610	EG	Ar(458,514)	164
631	pyrylium salt	dichloromethane	N_2(337)	36
631 (600–660)	Kiton Red 620; sulforhodamine B	methanol	FL	59,87
631 (bb)	pyrromethene 650	xylene	Nd:YAG (532)	153
633	DODC-I	methanol	Nd:YAG(532)	89
633 (615–655)	cresyl violet 670		Nd:YAG(532)	83
635	oxazole 4-3-18	EtOH(Ar)	FL	131

Table 3.1.1
Organic Dye Lasers Arranged in Order of Increasing Wavelength

Wavelength (nm)	Laser dye*	Solvent	Pump	Ref.
636 (603–670)	Kiton Red 620; sulforhodamine B	EG	FL	16
637	Kiton Red 620; sulforhodamine B	DMSO	FL	86
637 (608–682)	rhodamine B; 610	EG	Ar(cw)	47
637 (620–660)	cresyl violet 670	methanol	Nd:YAG(532)	53
637–650	coumarin 6-9-2	ethanol	FL	158
638 (610–670)	Kiton Red 620; sulforhodamine B	EG	Ar(cw)	47
639 (620–670)	cresyl violet 670	—	Nd:YAG(532)	84
639 (645–705)	cresyl violet 670	methanol	FL	81
640	rh. 640 perchlorate; 101	ethanol	FL	5
640 (610–680)	DCM	methanol	Nd:YAG(532)	53
640 (605–680)	DCM	BzOH/EG	Ar(514)	90
640 (620–670)	cresyl violet 670	$MeOH/H_2O$	Nd:YAG(532)	91
640 (620–680)	rh. 640 perchlorate; 101	ethanol	$N_2(337)$	92
642 (622–665)	Kiton Red 620; sulforhodamine B	$4\%LO/H_2O$	FL	19
642 (627–657)	rh. 640 perchlorate; 101	methanol	FL	26
643 (623–657)	rh. 640 perchlorate; 101	ethanol	FL	25
644 (620–673)	rh. 640 perchlorate; 101	ethanol	$N_2(337)$	93
645 (620–690)	rh. 640 perchlorate; 101	EG	Ar(458514)	164
645–705	cresyl violet 670	methanol	FL	81
646 (6250660)	cresyl violet 670	methanol	Nd:YAG(532)	91
647	cresyl violet 670	—	Nd:YAG(532)	91
648 (608–710)	rh. 640 perchlorate; 101	—	Kr(568)	52
649	DCM	DMF	FL	86
649 (615–688)	DCM	DMSO	Cu(511,578)	85
650	rh. 640 perchlorate; 101	methanol	FL	62
652 (620–687)	rh. 640 perchlorate; 101	$MeOH/H_2O$:1/1	FL	19
654 (601–716)	DCM	DMSO	$N_2(337)$	86
654–669	coumarin 6-9-2	EtOH+HCl	FL	158
655	DCM	DMSO	FL	86
655 (646–697)	cresyl violet 670	methanol	FL	25
656	coumarin 6-9-2	EtOH+HCl	L(520)	158
656	sulfohodamine 640; 101	$MeOH/H_2O$:1/1	cw	71
659 (650–695)	cresyl violet 670	ethanol	FL	25
660	LD 690 perchlorate	methanol	Nd:YAG(532)	94
660 (641–687)	cresyl violet 670	ethanol	$N_2(337)$	20
662 (600–706)	coumarin 6-5-6	1,2-DCE	XeCl	132

Table 3.1.1
Organic Dye Lasers Arranged in Order of Increasing Wavelength

Wavelength (nm)	Laser dye*	Solvent	Pump	Ref.
662 (648–682)	sulfohodamine 640; 101	MeOH/H_2O:1/1	FL	26
664 (631–705)	Cresyl violet 670	methanol	FL	59
668	benzoxazinone 8-1-7	ethanol	N_2(337)	138
668 (646–680)	sulfohodamine 640; 101	EG	Ar	90
668 (649–700)	oxazine 720; 170	methanol	Nd:YAG(532)	53
668 (655–705)	LD 690 Perchlorate	ethanol	Nd:YAG(532)	93
670	pyrylium salt	dichloromethane	N_2(337)	36
670 (660–716)	LD 690 perchlorate	DMSO/EtOH:2/1	N_2(337)	93
671 (613–708)	oxazine 720; 170	methanol	Nd:YAG(532)	51
671 (634–704)	rh. 640 perchlorate: 101	DMSO+HCl	N_2(337)	86
672	oxazine 720; 170	ethanol	Nd:YAG(532)	81
673 (650–696)	cresyl violet 670	EG	Ar(cw)	47
674 (641–712)	coumarin 6-5-7	1,2-DCE	XeCl	132
675	HIDC-I	methanol	Nd:YAG→585	95
675 (628–712)	coumarin 6-5-8	1,2-DCE	XeCl	132
681	oxazine 725; 1	CH_2Cl_2	FL→R610	96
681 (662–710)	Nile Blue 690; A	—	Nd:YAG(532)	84
683	Nile Blue 690; A	methanol	Nd:YAG(532)	97
684 (661–724)	LDS 698/pyridine 1	methanol	Cu(511,578)	161
687–826	oxazine 725; 1	DMSO/EG/COT	Kr(647)	98
690	LD 700 perchlorate	alcohol	Nd:YAG→585	96
690	Nile Blue 690; A	ethanol	laser	80
690	oxazine 725; 1	CH_2Cl_2	Nd:YAG(532)	97
690 (684–736)	carbazine 720; 122	ethanol	Nd:YAG(532)	53
692 (676–698)	oxazine 720; 170	methanol	FL	25
695	oxazine 725; 1	DMSO	FL→R610	96
695 (658–738)	LDS 698/pyridine 1	methanol	Nd:YAG(532)	26
695 (675–708)	cresyl violet 670	EG	Ar(458-514)	164
696 (683–710)	Nile Blue 690; A	ethanol	N_2(337)	20
696–780	LD 690 perchlorate	EG	Kr(cw)	99
698 (682–720)	oxazine 720; 170	methanol	FL	26
699 (675–711)	oxazine 720; 170	ethanol	FL	25
699 (680–740)	carbazine 720; 122	ethanol	Nd:YAG(532)	84
700	carbazine 720; 122	ethanol	Nd:YAG(532)	97
700 (680–738)	carbazine 720; 122	methanol,TEA	FL	73,100
705	Nile Blue 690; A	methanol	FL	25
705 (675–730)	oxazine 720; 170	MeOH/H_2O	FL	19
705–735	DTDC-1	DMSO	ruby(694.3)	89
706 (692–752)	LD 700 perchlorate	ethanol	N_2(337)	93

Table 3.1.1
Organic Dye Lasers Arranged in Order of Increasing Wavelength

Wavelength (nm)	Laser dye*	Solvent	Pump	Ref.
710 (670–760)	LDS 698/pyridine 1	DMSO	XeCl(308)	163
710 (690–740)	oxazine 720; 170	methanol	FL	70
710–755	Dmo-DTDC-1	DMSO	ruby(694.3)	89
711	DmOTC-1	acetone	ruby(694.3)	101
711	DTDC-1	acetone	ruby(694.3)	101
714	10-Cl-5,6-Dbz-DTDC-1	acetone	ruby(694.3)	101
715	oxazine 725; 1	ethanol	FL	80
716 (692–743)	LDS 730/Styryl 6	methanol	Nd:YAG(532)	164
717 (689–750)	Nile Blue 690; A	methanol	FL	59
718	carbazine 720; 122	DMSO	Nd:YAG(532)	102
718 (675–750)	LDS 698/pyridine 1	DMSO	N_2(337)	165
720	carbazine 720; 122	ethanol	FL	102
720	HIDC-1	methanol	Nd:YAG→585	95
720 (680–760)	carbazine 720; 122	ammonyx TEA	Nd:YAG(532)	91
720 (698–758)	LD 700 perchlorate	ethanol	N_2(337)	93
720–775	DTDC-1	DMSO	Kr	103
722	Nile Blue 690; A	methanol	FL	87
722 (685–760)	LDS 722/pyridine 2	methanol	Nd:YAG(532)	164
722 (687–755)	LDS 722/pyridine 2	methanol	Cu(511,578)	161
722 (698–743)	LDS 750/styryl 7	methanol	Nd:YAG(532)	164
722 (704–786)	oxazine 750 perchlorate	methanol	Nd:YAG(532)	51
723 (688–800	oxazine 725; 1	—	Kr(red)	52
724 (695–761)	oxazine 725; 1	methanol	Nd:YAG(532)	51
725 (705–745)	oxazine 725; 1	MeOH/R590	FL	59
725 (705–750)	oxazine 725; 1	ethanol	N_2(337)	20
725–765	DOTC-I (DEOTC)	DMSO	ruby(694.3)	96
725–780	DmOTC-I	DMSO	ruby(694.3)	89
726 (688–808)	LDS 698/pyridine 1	PC/EG:15/85	Ar(458–514)	164
730 (692–782)	Nile Blue 690; A	EG	Kr(cw)	47
732	DOTC-1 (DEOTC)	MeOH/N_2/COT	FL→R610	95
734 (683–776)	carbazine 720; 122	EG(ethanol)	Kr(SF)	102
735 (700–780)	LDS 722/pyridine 2	DMSO	N_2(337)	166
737 (700–810)	LD 700 perchlorate	EG	Kr(SF)	13
740	carbazine 720; 122	DMSO	FL	73,100
740	DOTC-I (DEOTC)	DMSO	Nd:YAG→585	95
740 (700–820)	LD 700 perchlorate	EG	Kr(647,676)	13
740 (720–758)	oxazine 725; 1	CH_2Cl_2	FL	25
740–770	D-2-QDC-1	EG	ruby(694.3)	89
742	DOTC-I (DEOTC)	acetone	ruby(694.3)	101

Table 3.1.1
Organic Dye Lasers Arranged in Order of Increasing Wavelength

Wavelength (nm)	Laser dye*	Solvent	Pump	Ref.
742–874	DOTC-I (DEOTC)	EG/DMSO:3/1	Kr(647)	98
744	DTDC-I	DMSO	N_2(337)	104
745	11-Br-Dm-2-QDC-I	glycerin	ruby(694.3)	101
745	DOTC-I (DEOTC)	DMSO	FL→R610	96
745 (645–810)	oxazine 725; 1	DMSO/EGor G	Kr(647,676)	103
745 (700–785)	oxazine 750 perchlorate	ethanol	FL→R640	25
746	DTDC-P	DMSO	N_2(337)	104
747 (682–810)	LDS 722/pyridine 2	PC/EG	Ar(458-514)	167
747 (687–811)	carbazine 720; 122	EG(ethanol)	Kr(647,676)	102
749	Dm-4-QC-I	glycerin	ruby(694.3)	101
750 (695–801)	oxazine 725; 1	DMSO/EG	Kr(647,676)	164
750 (710–790)	Nile Blue 690; A	EG	R590(Ar)	164
750 (714–790)	LDS 751/styryl 8	methanol	Nd:YAG(532)	164
750–810	DmOTC-I	DMSO	ruby(694.3)	48
750–825	DOTC-I (DEOTC)	methanol	FL→R640	25
751	Dm-4-QC-I-Br	glycerin	ruby(694.3)	101
754	Dm-4-QC-I-Br	glycerin	ruby(694.3)	101
754	DOTC-I(DEOTC)	DMSO	Nd:YAG(532)	105
756 (736–793)	DOTC-I(DEOTC)	DMSO	Nd:YAG(532)	51
760–775	oxazine 750 perchlorate	DMSO	Nd:YAG→585	95
764 (738–800)	LDS 765	methanol	Nd:YAG(532)	164
765 (715–840)	LDS 751/styryl 8	PC/EG	Ar(458–514)	164
767 (743–787)	LDS 765	methanol	Cu(511,578)	161
770	DOTC-I (DEOTC)	DMSO	Nd:YAG→585	95
770 (750–835)	oxazine 750 perchlorate	EG/DMSO:4/1	Kr(647)	106
770–830	HITC-I	DMSO	FL→R620	88
774	DTTC-I	acetone	ruby(694.3)	101
775 (747–885)	oxazine 750 perchlorate	EG/DMSO:84/16	Kr(647,676)	164
776 (747–801)	oxazine 750 perchlorate	EG/DMSO:2/1	Kr(647,676)	107
780 (749–825)	oxazine 750 perchlorate	EG	Kr(647,676)	107
780–883	HITC-I	DMSO	ruby(694.3)	28
782	DOTC-I (DEOTC)	DMSO	N_2(337)	104
783 (750–833)	DOTC-I (DEOTC)	EG	Kr(647,676)	108

Table 3.1.1
Organic Dye Lasers Arranged in Order of Increasing Wavelength

Wavelength (nm)	Laser dye*	Solvent	Pump	Ref.
785	DTTC-I	DMSO	N_2(337)	104
788	DmOTC-I	DMSO	N_2(337)	104
790–840	HITC-I	DMSO	ruby(694.3)	89
790–871	DTTC-I	DMSO	ruby(694.3)	28
795 (765–875)	DOTC-P (DEOTC)	DMSO+EG	Kr(647,676)	164
795 (768–850)	LDS 798/styryl 11	PC/EG:15/85	Ar	168
795–815	IR-123-I (DTTC)-I	DMSO	ruby(694.3)	89
798 (765–845)	LDS 798/styryl 11	methanol	Nd:YAG(532)	164
~800 (750–864)	DmOTC-I	DMSO+EG	Kr(647,676)	103
800 (755–870)	DOTC-I (DEOTC)	DMSO+EG	Kr(647,676)	103
800–870	IR-144 (HITC type)	EG	FL→R640	109
800–882	HITC-I	EG	FL→R640	25
805–872	IR-140-P(DTTC)	ethanol	FL→Ox720	25
806 (788–832)	HITC-I	DMSO	Nd:YAG(532)	51
807 (784–830)	HITCI	ethanol	Rh6G(587)	188
808 (756–871)	DOTC-I (DEOTC)	EG	Kr(red)	52
810–830	DTTC-Br	DMSO	ruby(694.3)	89
815	11-Br-D-2-QDC-I	glycerin	ruby(694.3)	101
815 (793–845)	LDS 821/styryl 9**	methanol	Cu(511,578)	161
815–870	DTTC-I	EG	FL→R640	25
818 (785–850)	LDS 821/styryl 9**	methanol	XeCI(308)	169
818 (785–851)	LDS 821/styryl 9**	methanol	Nd:YAG(532)	164
819	HITC-I	acetone	ruby(694.3)	101
820–875	5-Temo-DTTC-I	DMSO	ruby(694.3)	89
820–900	DTTC-I	DMSO	FL→KR620	88
821 (802–852)	LDS 821/styryl 9**	PC	N_2(337)	170
822	HITC-I	DMSO	Nd:YAG→700	110
828 (813–859)	DTTC-I	DMSO	Nd:YAG(532)	51
829	DTTC-I	acetone	ruby(694.3)	101
830	11-Br-Dm-4-QDC-I	methanol	ruby(694.3)	101
830	IR-123-I(DTTC)-I	DMSO	FL	109
832–911	HITC-I	EG/DMSO:3/1	Kr(647)	98
834	DTTC-I	ethanol	Nd:YAG→700	110
834 (817–842)	LDS 821/styryl 9**	methanol	FL	26
834–892	IR-144 (HITC type)	EG/DMSO	Kr(752,799)	111
834–900	4,5-Dbz-DTTC-I	DMSO	ruby(694.3)	28
835-890	IR-144 (HITC type)	DMSO	ruby(694.3)	98
836	HITC-I	EG	ruby(694.3)	112
839 (826–850)	HIDC-I	DMSO	N_2(337)	20
840–870	DTTC-I	DMSO	Kr	59

Table 3.1.1
Organic Dye Lasers Arranged in Order of Increasing Wavelength

Wavelength (nm)	Laser dye*	Solvent	Pump	Ref.
840–920	IR-125-I(HITC type)	DMSO	ruby(694.3)	89
845 (780–960)	LDS 821/styryl 9**	PC/EG	Ar(458–514)	164
845–920	D-4-QDC-I	DMSO	ruby(694.3)	89
849	HITC-I	DMSO	Nd:YAG(532)	111
850–930	IR-140-P(DTTC)	DMSO	ruby(694.3)	89
853	5,6-Temo-DTTC-I	acetone	ruby(694.3)	101
855-885	5,6-Temo-DTTC-I	DMSO	ruby(694.3)	89
860	4,5-Dbz-DTTC-I	acetone	ruby(694.3)	101
862	HITC-I	DMSO	N_2(337)	104
862 (851–890)	LDS 867	methanol	Cu(511,578)	161
863 (816–855)	DTTC-I	DMSO	ruby(694.3)	89
863 (844–885)	IR-144 (HITC type)	DMSO	Nd:YAG→700	25,110
863 (846–907)	IR-125-I(HITC type)	DMSO	Nd:YAG	51
863–1048	IR-132-P(DTTC)	EG/DMSO:3/1	Kr(752)	113
865 (825–912)	HITC-I	—	Kr(red)	52
865–920	D-2-QTC-I-I	DMSO	ruby(694.3)	28
866 (830–910)	LDS 867	methanol	Nd:YAG(532)	164
869	IR-144 (HITC type)	DMSO	Nd:YAG(532)	105
869 (832–888)	HITC-I	EG	Kr(752,799)	108
870 (812–929)	HITC-P	DMSO+EG	Kr(752,799)	103
870 (828–909)	HITC-P	DMSO+EG	Kr(647,676)	103
873 (819–937)	HITC-I	EG/DMSO:3/1	Kr(752)	113
874	IR-144 (HITC type)	DMSO	Nd:YAG(532)	114
875	IR-109-I(DTTC)	DMSO	FL	109
875 (840–940)	HITC-P	EG/DMSO:84/16	Kr(647,676)	164
875–916	IR-140-P(DTTC)	DMSO	FL→Ox720	25
875–920	IR-132-P(DTTC)	DMSO	ruby(694.3)	89
876	DTTC-I	DMSO	N_2(337)	104
880 (793–923)	LDS 821/styryl 9**	PC/EG	Kr(647)	171-2
883	IR-139-P(DTTC)	DMSO	FL	109
885	IR-116-I(DTTC)	DMSO	FL	109
887–986	IR-140-P(DTTC)	EG/DMSO:3/1	Kr(752,799)	98
888	IR-134-P(DTTC)	DMSO	FL	109
889	DTTC-I	DMSO	FL	151,152
893 (882–913)	IR-140-P(DTTC)	DMSO	Nd:YAG(532)	51
898	D-2-QTC-I-I	acetone	ruby(694.3)	101
898	IR-140-P(DTTC)	DMSO	Nd:YAG→700	101
903	IR-125-I(HITC type)	DMSO	Nd:YAG→700	101
908	IR-140-P(DTTC)	DMSO	Nd:YAG(532)	105

Table 3.1.1
Organic Dye Lasers Arranged in Order of Increasing Wavelength

Wavelength (nm)	Laser dye*	Solvent	Pump	Ref.
910	IR-132-P(DTTC)	DMSO	Nd:YAG(532)	111
910	IR-140-P(DTTC)	DMSO	Nd:YAG(532)	111
913	IR-125-I(HITC type)	DMSO	Nd:YAG(532)	111
916–984	IR-132-P(DTTC)	EG/DMSO:3/1	Kr(752,799)	98
920 (880–965)	6,7-DBZ-HITC-P	DMSO+EG	Kr(752,799)	103
920–950	12A-DTTeC-P	DMSO	ruby(694.3)	89
925 (875–1050)	LDS 925/Styryl 13	PC/EG	Ar	173
927 (855–1032)	IR-137-P(DTTC)	EG/DMSO:3/1	Kr(752)	113
927 (858–1030)	IR-140-P(DTTC)	EG/DMSO:3/1	Kr(752)	113
928	4,5-Dbz-DTTC-I	DMSO	FL	104
935–1019	12A-DTTeC-P	EG/DMSO:1/1	Kr(752,799)	115
940	IR-125-I(HITC type)	DMSO	FL	109
946	IR-141-I(DTTC)	DMSO	FL	109
946 (922–963)	LDS 867	DMSO	FL	26
949–880	IR-144 (HITC type)	DMSO	FL	89
950	IR-137-P(DTTC)	DMSO	FL	109
950	IR-140-P(DTTC)	DMSO	FL	109
950 (862–1013)	IR-140-P(DTTC)	EG/DMSO:1/1	Kr(752,799)	115
960 (902–1023)	LDS 925/Styryl 13	DMSO	XeCI(308)	174
960 (913–1020)	IR-143-P(DTTC)	EG/DMSO:1/1	Kr(752,799)	115
962	IR-140-P(DTTC)		Kr(IR)	52
970 (894–1095)	IR-143-P(DTTC)	EG/DMSO:3/1	Kr(752)	113
970 (915–1058)	12A-DTTeC-P	EG/DMSO:3/1	Kr(752)	113
972	IR-132-P(DTTC)	DMSO	FL	109
972	IR-143-P(DTTC)	DMSO	FL	109
975 (930–1040)	LDS 925/styryl 13	PC/EG	Nd:YAG(532)	175
980 (928–1084)	styryl 14	PC/EG	Ar	173
983–1081	D-4-QTC-I-I	DMSO	ruby(694.3)	89
1000	D-4-QTC-I-I	acetone	ruby(694.3)	101
1084–1125	DNDTPC-P	DMSO	Nd:YAG(1064)	116-7
1124 (1102–1148)	9,11,15,17-Dnp-DTPC-p	DMSO	Nd:YAG(1064)	118
1140	Dye 9860, Q-switch II	DCE	Nd:YAG(1.06)	176,180
1140 (1107–1187)	9,11,15,17-Dnp-5,6-Temo-DTPC-P	—	Nd:YAG(1064)	119
1172 (1151–1198)	9,11,15,17-Dnp-6,7-DBZ-DTPC-P	DMSO	Nd:YAG(1064)	118
1180–1530	Dye 5, Q-switch	—	Nd:YAG(1064)	183-4
1190 (1150–1240)	Dye 26, IR-26	DCE	Nd:YAG	117,182

Table 3.1.1
Organic Dye Lasers Arranged in Order of Increasing Wavelength

Wavelength (nm)	Laser dye*	Solvent	Pump	Ref.
1231 (1192–1285)	DNDTPC-P	DMSO	Nd:YAG(1064)	119
1270 (1200–1320)	Dye 26, IR-26	BzOH	Nd:YAG	179
1320 (1180–1400)	Dye 5, Q-switch 5	DCE	Nd:glass	176,181
1550	S401	DCE	Nd:glass	178
1600	S301	DCE	Nd:glass	178
1800	S501	DB	Nd:glass	178

* For common names of the dyes and details of the dye structures, see Steppel, R. N., Organic Dye Lasers, in *Handbook of Laser Science and Technology, Vol. I: Lasers and Masers*, CRC Press, Boca Raton, FL (1982), p. 299, and Steppel, R. N., Organic Dye Lasers, in *Handbook of Laser Science and Technology, Suppl. 1: Lasers*, CRC Press, Boca Raton, FL (1991), p. 219.
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Section 3.2

RARE EARTH LIQUID LASERS

Introduction to the Table

Rare Earth Chelate Lasers

Rare earth chelate lasers are listed in order of increasing wavelength in Table 3.2.1 together with the lasing ion, chelating agent, and references. The lasing wavelength and output of these lasers depend on the characteristics of the optical cavity and the rare earth concentration. The original references should therefore be consulted for this information and its effect on the lasing wavelength.

Rare Earth Aprotic Lasers

Rare earth aprotic lasers are listed in order of increasing wavelength in Table 3.2.2 together with the lasing ion, solvent, and references. Rare earth aprotic laser amplifiers are listed separately in Table 3.2.3. The wavelength and output of these lasers depend on the characteristics of the optical cavity and the rare earth concentration. The original references should therefore be consulted for this information and its effect on the lasing wavelength.

Further Reading

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Table 3.2.1
Rare Earth Chelate Lasers Arranged in Order of Increasing Wavelength

Wavelength (μm)	Ion	Ligand	Solvent	Reference
0.547	Tb^{3+}	trifluoroacetylacetone	acetonitrile	1
0.547	Tb^{3+}	trifuoroacetylacetone	dibenzoylmethide	1
0.611	Eu^{3+}	benzoylacetonate	ethanol-methanol (3:1)	2,3
0.611	Eu^{3+}	benzoylacetonate	dimethyl formamide	3
0.6117	Eu^{3+}	m-chlorobenzoyl-trifluoroacetonate	acetonitrile	4
0.6117	Eu^{3+}	p-chlorobenzoyl-trifluoroacetonate	acetonitrile	4
0.6117	Eu^{3+}	o-fluorobenzoyl-trifluoroacetonate	acetronitrile	4
0.6117	Eu^{3+}	p-fluorobenzoyl-trifluoroacetonate	acetonitrile	4
0.6117	Eu^{3+}	o-bromobenzoyl-trifluoroacetonate	acetonitrile	4
0.6117	Eu^{3+}	m-bromobenzoyl-trifluoroacetonate	acetonitrile	4
0.6117	Eu^{3+}	p-bromobenzoyl-trifluoroacetonate	acetonitrile	4
0.6118	Eu^{3+}	m-fluorobenzoyl-trifluoroacetonate	acetonitrile	4
0.6118	Eu^{3+}	α-naphthoyl-trifluoroacetonate	acetonitrile	5
0.6118	Eu^{3+}	o-chlorobenzoyl-trifluoroacetonate	acetonitrile	4,6
0.6118	Eu^{3+}	benzoyltrifluoroacetonate	acetonitrile	7
0.6118	Eu^{3+}	benzoyltrifluoroacetonate	acetonitrile	8
0.6119	Eu^{3+}	benzoyltrifluoroacetonate	ethanol-methanol dimethyl formade (7.5:2.5:1)	9
0.6119	Eu^{3+}	benzoyltrifluoroacetonate	acetonitrile	10
0.6119	Eu^{3+}	trifluoroacetylacetonate	acetonitrile	9

0.612	Eu^{3+}	dibenzoylmethide	ethanol-methanol-dimethyl formade (9:3:2)	11
0.612[(a)]	Eu^{3+}	4,4,4-trifluoro-phenyl-1,3-butanedione	acetonitrile	12
0.6122	Eu^{3+}	trifluoroacetylacetonate	ethanol-methanol (3:1)	13
0.6123	Eu^{3+}	benzoylacetonate	acetonitrile	14
0.6123	Eu^{3+}	thenoyltrifluoroacetonate	acetonitrile	14
0.6125	Eu^{3+}	thenoyltrifluoroacetonate	acetonitrile	8
0.6129	Eu^{3+}	benzoylacetonate	ethanol-methanol (3:1)	14–23
0.613	Eu^{3+}	benzoylacetonate	ethanol	22,24
0.613	Eu^{3+}	benzoylacetonate	ethanol-methanol (3:1)	13
0.613[(b)]	Eu^{3+}	dibenzoylmethane-phenantroline	ethanol-glycerol (3:1)	25
0.6131	Eu^{3+}	benzoylacetonate	ethyl/methyl alcohol (3:1)	26
1.054	Nd^{3+}	deuterotributyl phosphate	hexafluorobenzene	27
1.054	Nd^{3+}	deuterotributyl phosphate	carbon tetrachloride	27
1.057	Nd^{3+}	pentafluoropropionate + 1.10 phenanthroline	dimethyl sulfoxide	28
(c)	Nd^{3+}	$(TTA)_4Py$	acrylonitrile/carbon tetrachloride (1:9)	29

Note: Eu^{3+} laser action was also reported in Refs. 30–32 but no wavelengths were given.

(a) Stimulated emission in a planar microcavity.
(b) Microdroplet; lasing due to morphology-dependent resonances.
(c) Nd^{3+} laser action was reported in Ref. 29, but no wavelengths were given.

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Table 3.2.2
Neodymium Aprotic Liquid Lasers

Wavelength (μm)	Active center	Host crystal	Reference
1.050	$POCl_3–SnCl_4–UO_2^{2+}$	long-pulse	1
1.052	$POCl_3–SnCl_4$	long-pulse	2
1.053	$POCl_3–ZrCl_4$	long-pulse	3
1.053	$POCl_3–AlCl_3$	long-pulse	3
1.054	$POCl_3–AlCl_3$	long-pulse	3
1.054	$POCl_3–BBr_3$	long-pulse	3
1.054	$POCl_3–AlCl_3$	long-pulse	4
1.054	$POCl_3–SOCl_2–SnCl_4$	long-pulse	5
1.055	$SeOCl_2–SnCl_4$	long-pulse	6
1.055	$POCl_3–SnCl_4$	long-pulse	7,8
1.056	$SeOCl_2–SnCl_4$	long-pulse	4,9–12
1.056	$SeOCl_2–SnCl_4$	Q-switched	13–15
1.056	$SeOCl_2–SbCl_5$	long-pulse	4, 11
1.056	$SeOCl_2–SbCl_5$	Q-switched	16
1.056	$POCl_3–SnCl_4$	long-pulse	12,17
1.056	$POCl_3–ZrCl_4$	long-pulse	3,4,12,18,19
1.056	$POCl_3–ZrCl_4$	Q-switched	20–25
1.056	$POCl_3–AlCl_3$	long-pulse	4
1.058	$GaCl_3–SOCl_2$	long-pulse	26,27
1.058	$SeOCl_2–SnCl_4$	long-pulse	7,12
1.060	$POCl_3–SnCl_4$	long-pulse	28
1.061	$GaCl_3–CCl_3$	long-pulse	29
1.066	$PBr_3–SbBr_3–AlBr_3$	long-pulse	30
1.330	$SeOCl_2–SnCl_4$	long-pulse	31

Table 3.2.3
Neodymium Liquid Aprotic Single-Pass Laser Amplifiers

Wavelength (μm)	Oscillator	Solvent	Reference
1.056	Nd:silicate glass	$SeOCl_2–SnCl_4$	12,15, 32
1.056	Nd:$SeOCl_2–SnCl_4$	$SeOCl_2–SnCl_4$	15
1.052	Nd:$POCl_3–ZrCl_4$	$POCl_3–ZrCl_4$	19
1.062	Nd:$POCl_3$	$POCl_3–ZrCl_4$	18, 25, 33, 35
1.058	Nd:glass	$POCl_3–ZrCl_4$	35-37
1.053	Nd:ethylene glyol	ethylene glyol	38

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