

Table 17.3. Characteristics of laser radiation and their chemical applications.

Characteristic	Advantages	Applications
High power density	Multiphoton processes	Nonlinear spectroscopy
	Low detector noise	Saturation spectroscopy
Monochromatic	High scattering intensity	Improved sensitivity
	High resolution	Raman spectroscopy ←
	State selection	Spectroscopy ←
Collimated beam	Long path lengths	Isotope separation ←
	Forward-scattering observable	Photochemically precise
Coherent	Interference between separate beams	State-to-state ←
	Precise timing of excitation	reaction dynamics
Pulsed		Sensitivity
		Nonlinear Raman spectroscopy
		CARS
		Fast reactions ←
		Relaxation ←
		Energy transfer ←

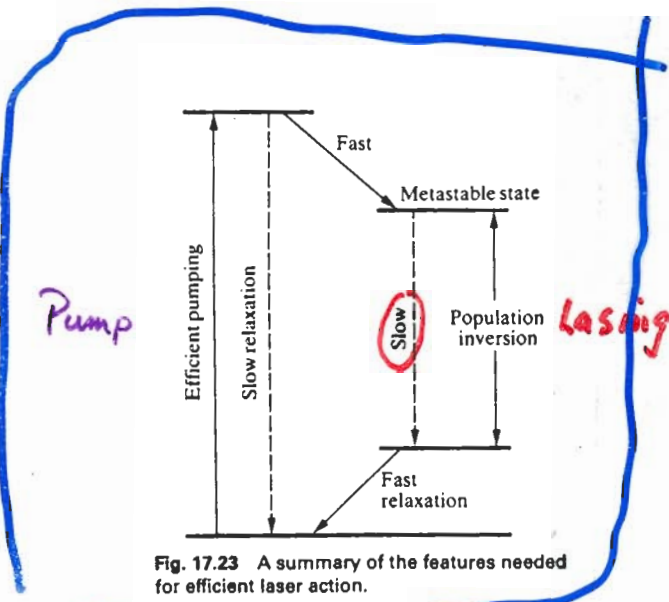


Fig. 17.23 A summary of the features needed for efficient laser action.

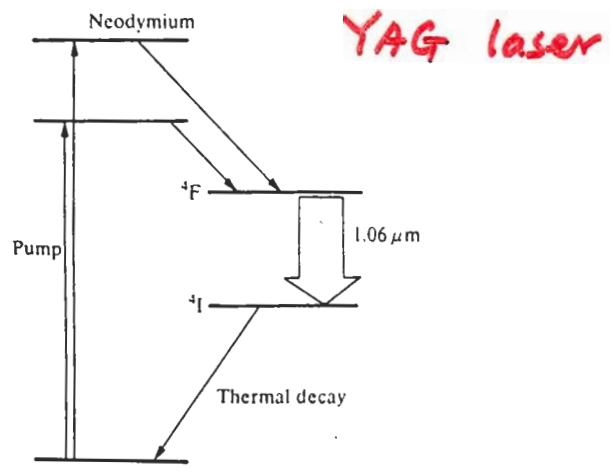


Fig. 17.25 The transitions involved in the neodymium laser. The laser action takes place between two excited states, and the population inversion is easier to achieve.

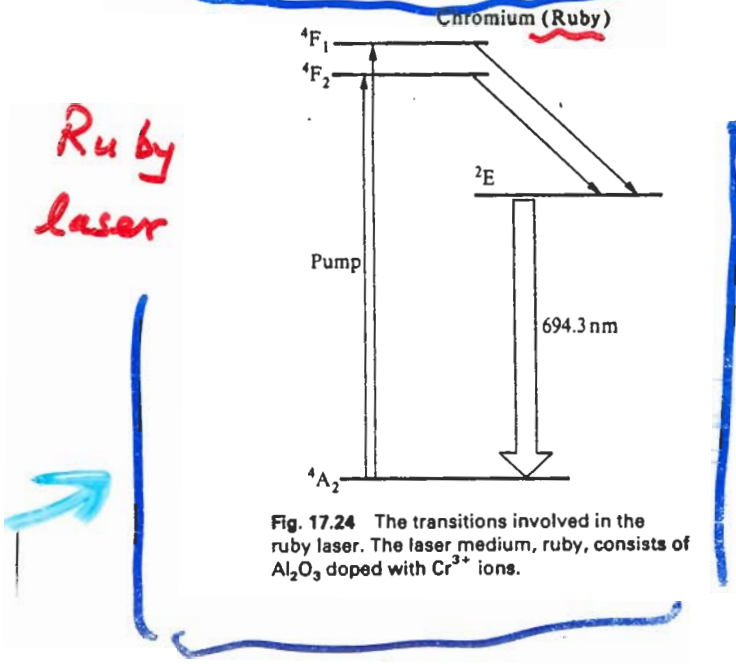


Fig. 17.24 The transitions involved in the ruby laser. The laser medium, ruby, consists of Al_2O_3 doped with Cr^{3+} ions.

Pump

Lasing

YAG laser

Ruby laser