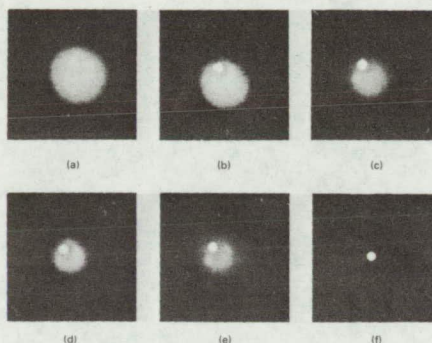


NASA TECH BRIEF



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Laser Action From a Terbium β -Ketoenolate at Room Temperature



Direct photographs of the laser beam showing beam collimation. This distance from the laser to the camera was increased as follows: (a) = 50 cm, (b) = 60 cm, (c) = 78 cm, (d) = 100 cm, (e) = 130 cm, (f) = 150 cm. The fluorescence diminishes in intensity with increasing distance. No change in the laser spot.

Laser activity has been achieved in a $2.5 \times 10^{-3}M$ solution of terbium tris (1, 1, 1-trifluoroacetylacetonate) at room temperature in a liquid solvent of acetonitrile or p-dioxane. The process used in the preparation of the liquid laser material consisted of dissolving two mmoles of anhydrous terbium trichloride in 50 ml, 1:4 ethanol:water mixture; nine mmoles of freshly distilled trifluoroacetylacetone was then added. A 0.15 M solution of ammonium hydroxide in water was slowly added until the pH of the entire solution remained constant at 5.7. After precipitation the microcrystals of hydrated tris chelate were filtered, washed in distilled water and dried. The solutions of crystals in p-dioxane or in acetonitrile showed no signs of deterioration after storage.

The solution was placed in a specially designed laser head that was pumped with uv energy from a xenon lamp. From the emission spectrum the lasing wavelength was found to be 5470Å which corresponds to the $^5D_4 \rightarrow ^7F_5$ transition in the Tb_3 ion. The laser threshold decreased upon lowering the cell temperature with precooled nitrogen gas. Above threshold of approximately 1700 Joules of pumping energy, the laser emission from the solution exhibited

line narrowing, characteristic spiking and beam collimation at room temperature.

Note:

No further documentation is available. Inquiries may be directed to:

Technology Utilization Officer
Goddard Space Flight Center
Greenbelt, Maryland 20771
Reference: B69-10324

Patent status:

No patent action is contemplated by NASA.

Source: Sven Bjorklund, G. Kellermeyer and C. R.

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(GSC-10593)
Category 02