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Solid state excimer lasers

G. ZERZA, G. SLIWINSKI* and N. SCHWENTNER

Institut für Experimentalphysik, FU Berlin, Arnimallee 14, 14195 Berlin, Germany
* Polish Academy of Sciences, IF-FM, Fiszeria 14, 80952 Gdansk, Poland

Doped rare gas crystals represent an interesting group of laser materials for which
stimulated emission and lasing has been demonstrated in the UV and visible spectral
range /1,2/. We report the results of an extensive investigation of Ar and Ne solids
binary doped with Xe and F for laser applications /2,3/. The XeF population is
photochemically prepared with high quantum efficiency and excited state densities in the
range of \(10^{18}/\text{cm}^3\) are generated. The emission lines are slightly red shifted in
comparison with the gas phase due to the dielectric interaction with the host. The XeF
cross sections for stimulated emission of \(10^{-18} - 10^{-18} \text{ cm}^2\) together with high inversion
densities result in large gain coefficients, e.g. for the D \(\rightarrow\) X (286 nm), B \(\rightarrow\) X (411 nm)
and C \(\rightarrow\) A(540 nm) transitions. Values of 11,6 and 7 \text{ cm}^{-1} are measured by means of
various methods. Experiments with optimized cavities allow for extraction of low
divergence beams (3 mrad) with quantum efficiencies up to 14%. Inhomogeneously
broadened spectral profiles and relaxation oscillations are observed in the C-A laser
emission of XeF in solid Ar.

References:
/1/ N. Schwentner, V.A. Apkarian; Chem.Phys.Lett.154,413,(1989)