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Infrared absorption and emission studies of Er:YAG, Er:KPb$_2$Cl$_5$, and Er:KPb$_2$Br$_5$ for eye-safe laser applications CRAIG HANLEY, EI BROWN, UWE HOMMERICH, Hampton University, SUDHIR TRIVEDI, Brimrose Corporation of America, JOHN ZAVADA, North Carolina State University —
There exists a significant current interest in the development of a new generation of 1.5-1.6μm eye-safe solid-state lasers with resonance diode laser pumping. Applications of laser sources that operate in the eye-safe wavelength regime near 1.5-1.6μm include remote sensing, long distance telemetry, and optical communications. Eye-safe laser wavelengths can be achieved by using trivalent Er^{3+}, which has an emission transition at $\sim$1.5μm. Prior to the development of resonantly pumped erbium lasers, two approaches were employed for eye-safe lasers, Nd-based lasers driving nonlinear optical parametric oscillators and erbium-doped glass lasers. System complexity and heat management limits the power scaling of these two approaches. The availability of new diode-pumped sources operating at $\sim$1.45μm has made resonantly pumped Er^{3+} lasers a viable choice for high-power eye-safe lasers. Crystalline Er:YAG is currently the main gain material under consideration for 1.5μm Er lasers. In this work we present spectroscopic results of ceramic Er:YAG, Er:KPb$_2$Cl$_5$, and Er:KPb$_2$Br$_5$. Infrared absorption and emission cross-sections were analyzed and evaluated for potential applications as 1.5μm gain media.

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