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Synthesis and Spectroscopic Properties of Neodymium doped Lead Chloride EI BROWN, UWE HOMMERICH, Hampton University, SUDHIR TRIVEDI, Brimrose Corporation of America, JOHN ZAVADA, US Army Research Office — Recently, great attention has been focused on the development of new solid-state laser materials for potential near infrared (NIR) and middle-infrared (MIR) laser applications. Lead halide based materials have recently emerged as new non-hygroscopic laser hosts with low maximum phonon energies. The low-phonon energies lead to small non-radiative decay rates and efficient infrared emission from rare earth dopants. In this work, the crystal growth and infrared spectroscopic properties of Nd doped lead chloride, $PbCl_2$, are discussed. Following optical pumping at 753 nm and 808 nm, Nd:$PbCl_2$ exhibited several near-infrared emission bands between 800 and 1600 nm as well as a broad MIR emission centered at 5.1μm ($^4I_{11/2} \rightarrow {}^4I_{9/2}$). The optical absorption, Judd-Ofelt (JO) parameters, and spontaneous emission probabilities of several Nd^{3+} transitions have been measured and calculated. Based on the JO analysis, the radiative quantum efficiency of the 5.1μm emission was determined to be $\sim$13%. The peak emission cross-section of 5.1 μm emission was estimated to be $\sim$0.4x10^{-20}cm^2, which is comparable to the other infrared laser transitions.

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