Diffusion doping and Infrared Optical Properties of Transition Metal Ions in ZnSe windows and Cd$_{0.55}$Mn$_{0.45}$Te crystals

EI NYEIN, UWE HOMMERICH, IVY JONES, MONIQUE CALHOUN, ERICA HAYNES, Hampton University, SUDHIR TRIVEDI, Brimrose Corporation of America — Transition metal (TM) doped II-VI semiconductors are of current interest for tunable solid state lasers in the mid-infrared (IR) spectral region as well as passive optical Q-switches. Laser action has been demonstrated at $\sim$2.3 $\mu$m from Cr: ZnSe, Cr: ZnS, Cr: CdSe, Cr: CdTe, Cr: CdMnTe, and at $\sim$4 $\mu$m from Fe: ZnSe. In this work, we report on the material preparation and IR optical properties of diffusion-doped TM ions (Cr$^{2+}$, Fe$^{2+}$, Co$^{2+}$) in polycrystalline ZnSe windows and Cd$_{0.55}$Mn$_{0.45}$Te crystals. Different dopant sources were employed in thermal diffusion experiments including TM chloride compounds, TM selenides, and elemental TM powders. The characteristic IR absorption bands from Cr$^{2+}$, Co$^{2+}$, and Fe$^{2+}$ doped II-VI hosts were observed in all samples, independent of the dopant source. Details of the absorption and luminescence properties of these TM: ZnSe and TM: CdMnTe samples will be presented at the conference.

Ei Nyein
Hampton University

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