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Impurity Solubility in Zn II-VI Semiconductors D.A. BARLOW, Santa Fe College, Gainesville, Fla. — The maximum n doping level in certain Zn II-VI semiconductors (ZnTe, ZnSe, ZnS, ZnO) is seemingly correlated with other properties of these solids. These include heats of formation, electronegativity differences, covalent radii, p-d repulsion energy and bond strengths. It has been suggested that the maximum attainable carrier concentrations in theses compounds is limited possibly due to the formation of certain vacancy and vacancy complexes which act to compensate carriers. However, recent reports indicate that the concentration of these defects in the solid are insufficient to explain doping limitations. We show here that the solubility of an anion dopant in the anion sub-lattice can be used as a guide to predict the ultimate maximum achievable n doping level in the above compounds. A standard statistical mechanical model which requires a formation energy is utilized to demonstrate this. This energy is then estimated using reported bond strengths for the binaries involved. The results suggest that dopant solubility is the determining factor for achieving maximum n doping in these materials.

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