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In this work we present the problems associated with preparing of single phase crystals, and influence of doping elements on microstructure and creating of defects into materials. The experimental results from recent studies of microhardness and magnetic properties are shown. The influence of defects, as vacancies and impurity atoms on structural parameters is investigated. The materials are DMS, semiconductor alloys and $A_{1-x}B_xC$ systems (with $B = \text{Sr, Zn, Mn, Gd}$). They are layers, heterostructures and monocrystals obtained by Bridgeman method, MBE, and direct synthesis. Here different models and methods are presented for investigation of the dependence of structural parameters and magnetic properties on doping element concentration, and impurity ion sites into host lattice.