How to make GaMnAs with high ferromagnetic phase transition temperature

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GaMnAs is a canonical ferromagnetic semiconductor with carrier induced ferromagnetic coupling between the Mn spins, randomly located at Ga sites in the GaAs host lattice. This ternary compound, with Mn content of up to 10 at.% can only be grown by a low temperature MBE technique. In contrast to the standard MBE growth procedures applied for GaAs, requiring the substrate temperatures of about 600°C, GaMnAs is grown at the temperatures in the range of 180 – 270°C, depending on the Mn content. These growth conditions, far away from the thermodynamic equilibrium, induce the formation of various types of structural point defects degrading the magnetic, transport and optical properties of the material. I will show what is the role of the defects and how to control their concentration, and in consequence, how to obtain GaMnAs with high ferromagnetic phase transition temperature, up to 150 – 170 K.

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