9.7 cm

Self-compensation and ferromagnetism in Mn-doped GaAs

Steven C. Erwin
Center for Computational Materials Science
Naval Research Laboratory, Washington DC, USA

Ferromagnetism in Mn-doped GaAs is generally believed to be mediated by holes arising from substitutional Mn. Measured hole concentrations are much smaller than expected from simple electron counting, for unknown reasons. We present theoretical evidence that the source of this compensation is interstitial Mn. We show that under non-equilibrium conditions characteristic of the low temperatures used during growth, interstitial Mn can be formed by a simple low-energy surface adsorption process. In the bulk, interstitial Mn plays a dual role: as a source of hole compensation, and as a source of localized spins whose interactions are mediated by electrons. We develop a mean-field theory of magnetism that self-consistently accounts for both substitutional and interstitial Mn as well as their mutual compensation.

13.4 cm

Subject category :

2. Magnetic Films, Surfaces and Multilayers

Presentation mode :
plenary talk

Corresponding author :
Steven C. Erwin

Address for correspondence :
Center for Computational Materials Science
Naval Research Laboratory, Washington DC, USA

Email address :
erwin@dave.nrl.navy.mil