

A New Type Diluted Magnetic Semiconductor Li(Zn,Mn)As

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Diluted magnetic semiconductor (DMS) exhibits unique magnetic and transport properties. By molecular beam epitaxy (MBE) employing a relatively low substrate temperature, it is possible to grow GaAs with magnetic impurity concentration up to the order about 10^{21}cm^{-3} , and then quite high transition temperatures are observed. However Mn dopant brings both localized spins and carriers in $\text{Ga}_{1-x}\text{Mn}_x\text{As}$, result in the lack of independent control of local moment and carrier densities, and the difficulty to study or control charge and spin variable quantitatively. Here we report that an individual control of carrier and spin can be realized in a new DMS for Mn-doped I-II-V type semiconductor $\text{Li}_{1+y}\text{Zn}_{1-x}\text{Mn}_x\text{As}$. The Li(Zn,Mn)As polycrystalline bulk samples show critical ferromagnetic transition temperature (T_C) up to 50K for $\text{Li}_{1.1}\text{Zn}_{0.90}\text{Mn}_{0.10}\text{As}$. Muon spin relaxation probed static magnetic order of full volume in the ferromagnetic region. Moreover the new DMS shows a soft magnetic behavior with the coercive force $< 100\text{Oe}$ that would be promising for prospective application¹. We appreciate contributions from Profs. S. Makawa, S. Uchida, Y. Y. Wang etc. More details about the results are in Ref.1.

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