

**Giant Faraday Rotation in Cd<sub>1-x</sub>Mn<sub>x</sub>Te (0 < x < 0.7) Crystals**

**Soe-seong Chung, Younghun Hwang, and Youngho Um\***

Department of Physics, University of Ulsan, Ulsan, 680-749, Korea

\*Corresponding author: yhum@ulsan.ac.kr, Phone: +82 52 259 2327, Fax: +82 52 259 1693

Diluted magnetic semiconductors (DMS's) are based on II-VI semiconductor compounds in which a fraction of the nonmagnetic cations are randomly replaced by magnetic ions[1]. One of the most striking effects observed in DMS's is the giant Faraday rotation at photon energies close to the band-gap energy[2]. This property makes DMS's promising candidates for fabricating magneto-optical devices, such as magnetic field sensors, isolators, and modulators[3]. Previously, Bartholomew *et al.*[4] have analyzed their Faraday rotation data for CdMnTe and ZnMnTe using a single-oscillator model for the index of refraction involving an interband excitonic transition at the fundamental gap  $E_0$ , however, at lower values of Mn ion. Therefore, we investigated the magneto-optical properties for the Cd<sub>1-x</sub>Mn<sub>x</sub>Te (0 < x < 0.7) single crystals grown using a vertical Bridgman method. The Cd<sub>1-x</sub>Mn<sub>x</sub>Te crystals with various Mn mole fractions have been grown in the zinc-behnde structure and the band-gap energy was increased and the lattice constant was decreased showing inverse relationship with the band-gap energy with increasing Mn contents. The Faraday rotation was increased as Mn content is increased and the Verdet constant becomes larger because the effect of the *sp-d* exchange interaction is enhanced as the temperature is lowered. The origin of the enhancement of the Faraday rotation in Cd<sub>1-x</sub>Mn<sub>x</sub>Te crystals can be explained in terms of the magnetization.

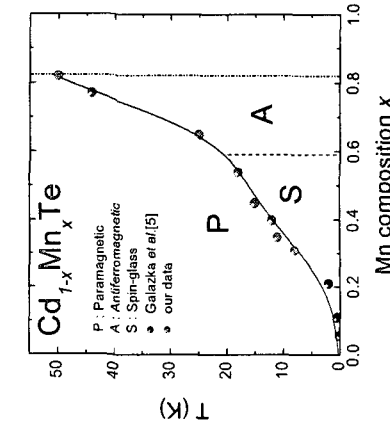


Fig. 1. Magnetic phase diagram for CdMnTe ISAMMA conference.

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**Weak Ferromagnetism in CdMnZnTe Single Crystal**

**Soo-Sung Chung, Younghun Hwang, and Youngho Um\***

Department of Physics, University of Ulsan, Ulsan, 680-749, Korea

\*Corresponding author: yhum@ulsan.ac.kr, Phone: +82 52 259 2327, Fax: +82 52 259 1693

For the last two decades, scientists have had considerable interest in diluted magnetic semiconductors (DMS's), in which a fraction of the nonmagnetic cations in II-VI, III-V, IV, and IV-VI compounds is replaced by a magnetic transition metal. The unique properties observed in DMS's are due to a magnetic interaction induced by the localized magnetic moments of magnetic ions and *s-p* band electrons[1]. Recently, ferromagnetic DMS's are extensively investigated for the applications spintronics due to their good compatibilities with the existing semiconductor devices[2,3]. This ferromagnetism should be also possible in other isoelectric II-VI semiconductors such as CdTe and ZnSe. Irie *et al.* reported that the Fe doped Mn-based DMS, Cd<sub>0.95</sub>Mn<sub>0.05</sub>Fe<sub>0.05</sub>Te, showed high temperature ferromagnetic behavior in the sample of  $x \sim 0.37$ [4]. In this work, we investigated the magnetic and magneto-optical properties of the Zn-added CdMnTe DMS, Cd<sub>0.65-y</sub>Mn<sub>0.37-y</sub>Zn<sub>y</sub>Te ( $x \sim 0.37$ ), and discuss the effect of the Zn on the magnetic nature of Cd<sub>0.65</sub>Mn<sub>0.37</sub>Te. In this work, we investigate the magnetic and magneto-optical properties of the Zn-addition to Cd<sub>0.65</sub>Mn<sub>0.37</sub>Te. The magnetization measurement of the sample showed the weak ferromagnetic ordering up to 250 K.

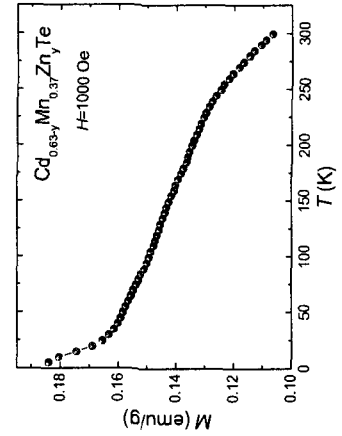


Fig. 1. M-T data for CdMnZnTe.

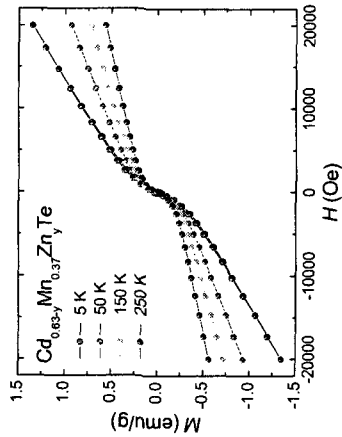


Fig. 2. M-H data for CdMnZnTe.

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