# 유기금속화학증착법에 의한 자성반도체 $Co_xTi_{1-x}O_2$ 박막의 제조 및 특성 (Preparation and Properties of $Co_xTi_{1-x}O_2$ Magnetic Semiconductor Thin films by Metal Organic Chemical Vapor Deposition)

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Spintronics, or spin electronics, is a rapidly expanding research area because of recent developments in the physics of spin-dependent phenomena and their potentially exciting new applications. Spintronics studies electronic devices that are based on electron spin. For use as spintronic materials, many researchers have studied diluted magnetic semiconductors(DMS), in which transition metal atoms are introduced into the lattice, thus inserting local magnetic moments into the lattice. A great deal of work has been carried out on the growth and properties of diluted magnetic semiconductors such as Mn-doped GaAs and ZnSe, but the measured Curie points remain well below room temperature. Mn-doped GaN and ZnO have been predicted to exhibit Curie temperature. As one of the II-VI compound semiconductors, ZnO has drawn much attention since it was expected that ZnO-based DMS is a possible candidate to realize a ferromagnetic semiconductor with both a high Tc above 300K and a large magnetization.

In contrast, Co-doped $TiO_2$ anatase, grown by pulsed laser deposition (PLD), has very recently been demonstrated to be weakly ferromagnetic(FM) and semiconducting for doping levels up to ~8% at.% and temperatures up to 400K.

In this work, $Ci_xTi_{1-x}O_2$ ($0 \leq x \leq 0.08$) thin films were grown on $SiO_2$(2000Å)/Si substrates using Liquid-delivery metalorganic chemical vapor deposition. After deposition, the thermal annealing was carried out at 700°C for 60 min in the vacuum chamber which was evacuated to $5\times10^{-6}$ Torr. The films with $SiO_2$(2000Å)/Si substrates showed polycrystalline structure. The resistivity of $Co_xTi_{1-x}O_2$ ($0 \leq x \leq 0.08$) film are about 1 to 3 ohm · cm. The magnetic response was measured as a function of magnetic strength(H) for the $x \leq 0.08$ film at room temperature, where the magnetic field was applied parallel to the film surface. Hysteresis is observed, indication that the Co-doped anatase film is ferromagnetic even at room temperature.