**Study of optical manipulation of ferromagnetism and spin-based photonics**

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**Abstract:**

An electronic system having itinerant character with moderate carrier concentrations (10^{15} - 10^{21} \text{cm}^{-3}) is an interesting system in that it allows us to study novel aspects of the interaction between charges and spins, with possible access by light and an electric field/current. Among various materials systems, semiconductors-based nanostructures are especially interesting, since they offer opportunities to examine our findings both from fundamental and device-application points of view [1]. In this presentation, we first review experimental results on the optical excitation of the carrier-induced ferromagnetic system \( p \)-(Ga,Mn)As, and discuss the possibility of controlling ordered spins by the energy and angular momentum of light. We will review two cases:

1. Optical excitation with linearly polarized light pulses and resultant precession of magnetization [2].

2. Optical excitation with circularly polarized cw-light and resultant change in surface magnetization [3].

We then discuss the opportunity of utilizing spin-dependent optical transition and spin-dependent carrier transport to fabricate spin-dependent optical devices, e.g., polarized-light detectors and emitters, with some concrete applications in mind. For this topic, we will review the following two topics:

3. electrical detection of spin-polarized current in III-V heterostructures and detection of circularly polarized light [4].

4. MnSb layers for optical isolators [5] and spin-light emitting diodes

**References**


