Spin transport in *p*-type diamond induced by spin-pumping

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Nitrogen-vacancy (NV) centers in diamond have attracted considerable interest to realize quantum information devices and quantum sensors [1]. To develop such devices, electrical initialization of electron and/or nuclear spins is required. In order to demonstrate the electrical initialization of spins in NV centers, polarized electron may be used for. Therefore, we focus on the spin injection into diamond by means of a spin-pumping.

In this study, we demonstrated spin transport experiment in a bron-doped *p*-type diamond induced by spin-pumping. A NiFe and Pd or Ta detectors were fabricated on a *p*-type diamond (Fig.1). Under the ferromagnetic resonance of the NiFe, spin current is injected into *p*-type diamond from NiFe. Because the electromotive forces (EMFs) observed in Ta is opposite to that in Pd, this study observed inverse spin Hall voltages in Pd and Ta detector. The results suggest injection of the spin-current into the diamond by the spin-pumping. In addition, we prepared NiFe and two Ta detectors on the diamond. The distance of NiFe to each Ta detectors are 1 μm and 14 μm. Both amplitude of the EMFs with two Ta detectors are almost the same with each other. This result suggests diamond may have long spin diffusion length, and may indicate that diamond is also attractive for semiconductor spintronics.

In the presentation, we will discuss details of spin-pumping experiments and spin diffusion length in *p*-type diamond.

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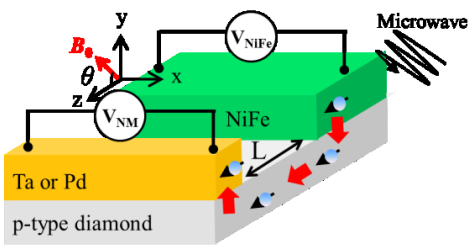

Fig.1. sample structure

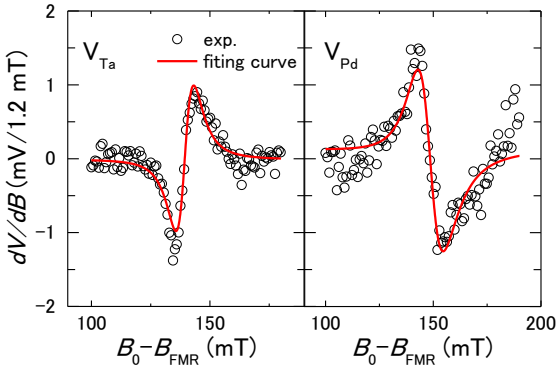

Fig.2. the EMFs in Ta and Pd detectors

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