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Spin polarization measurements in Fe_4N/MgO/NbN tunnel junctions using quasiparticle tunneling spectroscopy TAKAYUKI HOHJO, KEITA SAKUMA, TETSUYA MIYAWAKI, KENJI UEDA, Department of Crystalline Materials Science, Nagoya University, HIDEFUMI ASANO, YOSUKE KOMASAKI, MASAKIYO TSUNODA, Department of Electronic Engineering, Tohoku University — In spintronic applications, it is thought that Fe_4N is useful because it has been theoretically expected to have high spin polarization. Fe_4N/MgO/CoFeB magnetic tunnel junctions (MTJs) were fabricated, and an inverse tunnel magnetoresistance (TMR) effect was reported by our groups. However, spin polarization of Fe_4N is yet incompletely understood. We investigated spin polarization of Fe_4N, using quasiparticle tunneling spectroscopy (QTS), and the measured spin polarization of Fe_4N was compared with that in Fe_4N/MgO/CoFeB MTJs. Spin polarization of ferromagnetic materials can be directly measured by QTS. By using NbN and MgO as superconducting electrode and barrier layers, respectively, Fe_4N/MgO/NbN tunnel junctions were fabricated by magnetron sputtering. The thickness of MgO barrier layer was varied from 1.0 to 1.5 nm. The areal resistances of the Fe_4N/MgO/NbN tunnel junctions were close to those of Fe_4N/MgO/CoFeB MTJs, which had the same thickness of MgO barrier layer as those Fe_4N/MgO/NbN tunnel junctions. In QTS, spin polarization of Fe_4N was estimated to be ~ -0.68. This value is larger than spin polarization in MTJs.

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