

Spintronics based on magnetic tunnel junctions

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Magnetic tunnel junctions consist of two magnetic electrodes separated by very thin insulating barrier, which exhibits the large magnetoresistance effect originating from a quantum mechanical spin asymmetry of an electronic structure of a magnetic layer and/or interface. In early days of research the magnetoresistance ratio is below 20% [1-2]. Through the discovery of MgO crystalline barrier [3,4], the highest magnetoresistance ratio is over 600% at room temperature [5]. Nowadays, magnetic tunnel junctions are one of the core devices in various spintronics applications, in particular magnetic memory and sensors.

Here, I will talk our recent research on magnetic tunnel junctions utilizing various kinds of functional materials, e.g., magnetic tunnel junctions with hard magnets for high density magnetic random access memory applications [6,7], magnetic spin-valves with organic semiconductors [8,9]. Also, I would like to briefly mention possibilities to develop THz spintronics applications [10] and picotesla magnetic sensors for medical applications [11] using magnetic tunnel junctions.

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Fields of Research

Spintronics, Applied Physics

Publications

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