Semiconductor

R&D Project Title :
Spin-functional optoelectronic interface using 0-2D hybrid semiconductors

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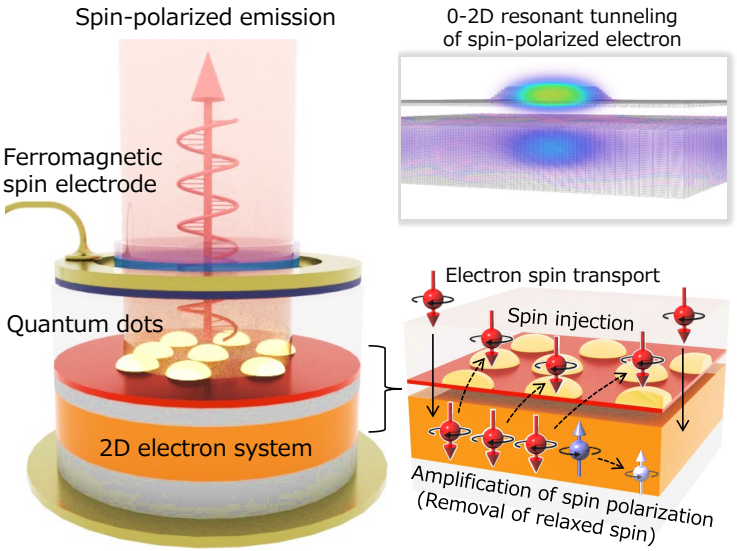
Summary :

Spin-polarized electron signals are photoelectrically converted, and the spin-polarized information is optically transmitted. The interface based on photoelectric spin devices is constructed by utilizing two-dimensional semiconductor electron systems and quantum dots with electron spin injection and amplification functions of the spin polarization.

We will develop photoelectric spin conversion devices with spin-functional optically active and spin transport layers using 0-2D hybrid semiconductors.

We will develop photoelectric spin-functional signal technology in which spin-polarized components are superimposed on optical signals, and photoelectric spin-functional input/output technology for establishing semiconductor photoelectric spin interfaces.

Spin-polarized optical signals, which are stable at room temperature, are generated and transmitted by photoelectric conversion. This makes it possible to use spin-polarized modulation for optical wiring between electronic circuit boards and chips. As a result, the power consumption of the entire electronic circuit system including I/O can be reduced. It will also contribute to optical transmission for non-volatile spin information.



Schematic illustration of a spin-polarized light emitting device using 0-2D hybrid semiconductor nanostructures;
Top right: Resonant spin-polarized electron wavefunction of 0-2D semiconductor
Bottom right: Spin dynamics of transport, polarization amplification, and injection