

Division of Transdisciplinary Sciences

Department of Advanced Materials Science

Laboratory	Faculty	Introduction of research activities and laboratory	Key words	Projects or activities summer program students can participate
Otani-Laboratory	Prof. YoshiChika OTANI	<p>The concept of spin current, a flow of spin angular momentum, appeared in the end of 20th century, and led to a new spintronic principle based on the atomic-scale angular momentum conservation such as spin-transfer-torque. The methods to generate, transport and detect the spin currents have been well established over the last decade, leading the spintronics research to a new phase. Recent studies revealed interconversions among quasi-particles such as electron, spin, phonon, photon and magnon etc. via spin current in a solid. These interconversions, called as "spin conversion", often take place in the nano-scale regions at the interfaces of different materials, and thus, have great versatility and application possibility. Our fundamental researches explore new processes of the spin conversion and clarify their mechanisms. We also develop the spintronics devices to control a variety of spin conversion processes using nanofabrication technologies.</p>	<p>Spin currents; spin torque; spin Hall effects; spin pumping; spin-orbit interaction</p>	<p>We are currently working on the following projects;</p> <ol style="list-style-type: none"> 1. Mechanisms of pure spin current generation and detection 2. Magnetic phase transition by using spin current 3. Spin-to-charge current conversion at the Rashba interface and the surface state of topological insulator 4. Spin injection into quantum materials such as Weyl semimetals