

Division of Environmental Studies

Department of Human and Engineered Environmental Studies

Laboratory	Faculty	Introduction of research activities and laboratory	Key words	Projects or activities summer program students can participate
Morita Laboratory	Prof. Takeshi MORITA	<p>By applying pressure to piezoelectric material, electrical energy can be generated; it means you can utilize this phenomenon for sensors or energy harvesters. On the contrary, by applying electrical field to the piezoelectric material, mechanical strain can be obtained with piezoelectric effect, which contributes to be actuators. Without complicated structure such as an electromagnetic coil shape, a conversion between electrical and mechanical energy is possible by using the piezoelectric effect. Based on the high conversion efficiency and the large energy density, piezoelectric effect is utilized for medical acoustic devices, ultrasonic transducer, micro energy harvester and so on.</p> <p>Our group is interested in developing innovative piezoelectric devices; for example, we propose new driving principle of piezoelectric actuator and sensor control system. At the same time, we believe that breakthrough comes from the fundamental understanding of the piezoelectric effect itself. Therefore, the research field is not limited to the design of the transducer but is expanded to the nonlinear piezoelectric vibration, the dynamic resonant frequency control and the shape-memory piezoelectric actuator, which are related to the domain structure inside the piezoelectric ceramics.</p>	<p>Piezoelectric effect, Functional material, Energy harvesting device, Modeling</p>	<p>A practical experience is quite effective for starting something new. In this project, a piezoelectric plate sandwiched with thin metal electrodes is provided to the students. Flipping this plate, the electrical energy between two electrodes will be confirmed by monitoring the oscilloscope. You can say that this is one of the energy harvesting devices. Then, please modify the mechanical structure and the electrical circuit for the practical device application. Of course we'll support you. You can use 3D printer and machining equipment.</p> <p>What do you want to utilize this piezoelectric plate for? Wind force power generation? Or, do you want to get energy from walking behavior by putting this material under yours shoes? Any idea is welcome, but maybe you don't like to study for boring topics. It's up to your proposal. After making your device, a modeling for the device is conducted to understand the piezoelectric effect.</p>