

**"Magnetostriction Power Generation  
- Energy Harvesting Material for IoT System without Battery-"**

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**Abstract**

Energy harvesting is one of the most important subjects over the world to realize ecological and sustainable society and also from the basic research activities. There have been a wide range of researches on renewable energy, especially on solar cell batteries and windmill power generation. However, these make instability in the transmission system, and limited in amount (in Japan max 5%, which is the control value of the total electric power and already over 3% reached). Therefore, we should reconsider the present situation on energy environment, and try to realize stable and reasonable systems for new energy supply.

Another important aspect of the present information based society is to maintain IoT systems, for which tremendous number of sensors are implemented with batteries for wireless information transmission, which life time is around 3 years, and have to be replaced by human labor. Therefore, electricity generation without battery for sensors is fundamentally necessary to maintain IoT systems.

In these days most popular small power generation by using the natural energy (mainly vibration) is the piezoelectric mechanical to electric energy conversion material. However, it does not function at low temperature in cold regions and not much efficient under small vibrational conditions. Accordingly, we should seek a new material replacing piezoelectric material to overcome these drawbacks. We have proposed magnetostriction material for this purpose. The first magnetostriction material was proposed by the US Naval Research Laboratory; GaFe, galfenol, which is a multi-crystal and less efficient than the existing piezoelectric material. We have tried to make it better by (1) single crystal growth, (2) theoretical prediction and realization of ternary materials, and (3) new efficient systems. In the talk, I will introduce such history of energy harvesting materials and present status.