Takeshita M et al., Mater Sci Nanotechnol 2018, Volume 2

DE WAVE POWER GENERATORS

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Increase in world population and the accompanying surge in demand for energy, food and water, as well as the sudden increase in energy consumption caused by recent industrial development and betterment of life standards in newly developing countries will accelerate global warming. Among the diverse measures proposed to meet our energy needs, the use of renewable energy is receiving increasing attention. Especially, the wave power generation has attracted attention as one of useful utilization methods for ocean energy. However, the conventional wave generators are large, expensive, and unable to efficiently generate electric power with small amplitude waves, limiting their widespread usage. To solve these problems, we will discuss the possibilities for a wave power generator using dielectric elastomer (DE) artificial muscle recently developed as a novel method for harvesting renewable energy. DE artificial muscle is a new smart material technology with characteristics and properties not seen in other materials. The basic element of DEs is a very simple structure comprised of thin polymer films (elastomers) sandwiched by two electrodes made of a stretchable material. DEs can operate as an electrically-powered actuator. When a voltage difference is applied between the electrodes, they are attracted to each other by electrostatic forces leading to a thickness-wise contraction and plane-wise expansion of the elastomer. The use of DE actuator in the reverse mode, in which deformation of the elastomer by external mechanical work is used to generate electrical energy, has been gaining more attention. As DE is very light, inexpensive, and easily formed into multiple layered structures, it can make a very simple and robust direct drive wave power system that is economically viable. DE has moved now from the research and development stage to the commercial domain with research and development on practical applications, and furthermore to the mass production stage.

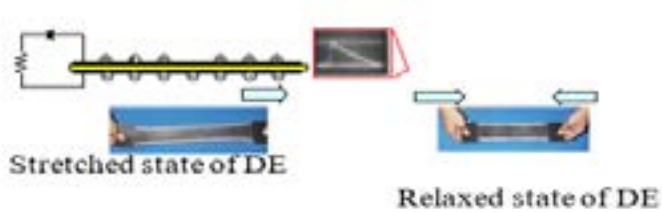

Figure.1: Operating principle of dielectric elastomer power generation; the DEG is basically a stretchable capacitor. If a charge is applied to the DEG in the stretched state, then work done by the contracting elastomer is converted into electrical energy (as illustrated by the voltage across the resistor in the right illustration).

BIOGRAPHY

Takeshita M has completed his graduation from the Tokyo Institute of Technology Interdisciplinary Graduate School of Science and Engineering in 2003 with a master's degree in Engineering studies. He is currently a Senior Researcher at the CNT Laboratory Materials Research Team, Research and Development Center, Zeon Corporation. He wrote many papers related to CNTs.

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