Energy-generating rubber combines flexibility and high-output

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Ricoh today announced that it has created a novel flexible material that converts pressure and vibration into electric energy with high efficiency.

Currently, piezoelectric materials, which generate electricity with mechanical strain, are drawing attention as energy-harvesting materials. Major piezoelectric materials are ceramics and polymers, but they have some deficits which prevent them from wide prevalence.

Piezoelectric ceramics are used for restricted purposes because of their fragility and heavy weight, although they generate relatively high electricity. On the other hand, piezoelectric polymers generate very slight electricity although they achieve flexibility by reducing the thickness.

The "energy-generating rubber" created by Ricoh generates as high a level of electricity as ceramics while its appearance is a soft and flexible sheet. Since it overcomes the deficits of previous piezoelectric ceramics and polymers, it could be applied to multiple uses, combining the advantages of flexibility and high output.

Ricoh will advance research in this technology aiming at commercializing the material for various purposes, especially flexible sensors. In the future, it will contribute to the coming Internet of Things, when various devices are equipped with communication features, by providing a promising energy-generating material.

Ceramics, a major traditional piezoelectric material, is routinely used in electronic parts of such utility equipment as pressure and vibration sensors. Although it generates enough electricity for those purposes, it has deficits: namely fragility, heavy weight and the inclusion of lead. By contrast to ceramics, the "energy-generating rubber" overcomes those deficits. Furthermore, its high durability has been confirmed through durability tests of several million periods.

Polymers, such as PVDF (polyvinylidene difluoride), generate slight electricity, though they have flexibility. The "energy-generating rubber" has acquired both sensitivity to light load and durability against heavy load by combining high output comparable to ceramics and more flexibility than polymers.

In addition, "energy-generating rubber" has advantages in workability and productivity because it is soft, and does not require a high-temperature process like ceramics. Flexible, high-output, durable, workable and productive, "energy-generating rubber" can be installed in various locations and large spaces. It can therefore be used for various purposes in the wider market compared with ceramics and polymers.

The mechanism of the "energy-generating rubber" is not the same as that of previous piezoelectric materials. Ricoh, in collaboration with Tokyo University of Science (Project leader: Associate professor Takahiro Yamamoto), launched mechanism analysis at the molecular level using leading computational chemistry. The study results will expand the possibility of the material, and will help development and application to various purposes and areas in the future.

With the advantages of "energy-generating rubber", Ricoh will seek to contribute in the age of IoT, providing innovative solutions with a combination of external technology.

Provided by Ricoh