

Energy harvesting device driven by transpiration for sensor power supply

Ryohei AOKI^{1*}, Yusuke NOGUCHI¹ and Risa NISHIO¹

¹ School of Science for Open and Environmental Systems, Graduate School of Science and Technology, Keio University, 3-14-1, Hiyoshi, Kouhoku-ku, Yokohama, Kanagawa 223-8522, Japan

* Corresponding author

Submission Category:

(A)

SDGs Targets/Indicators:

Targets

7.3 By 2030, double the global rate of improvement in energy efficiency

9.4 By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities

Indicators

9.b.1 Proportion of medium and high-tech industry value added in total value added

Abstract:

In this research proposal, we propose a new energy harvesting device that is expected to be applied in the field of agriculture and forestry. Energy harvesting devices use low density environmental energy that is not normally used to carry out local production of energy. By using the energy harvesting device in combination with IoT sensors, wireless sensor network without batteries can be achieved. The device in this research extracts environmental energy such as light, wind and heat in the form of transpiration of water, and converts it into kinetic energy of water. And it generates electricity by motion of water using a piezoelectric element. The greatest feature of this device is that once it is properly installed, power generation can be continued by leaving it alone. Since water is supplied to the device by precipitation and power is generated, it is assumed to be used in the open field with a certain amount of precipitation. Within this proposal, we investigated about sensing in the field of agriculture and forestry. In addition, since it can generate electricity if it is self-sufficient in water, potential demand in other fields can be expected. As a research plan, the design of the fluidic channel and the transpiration section will be required. In addition, because it is a fine fluidic channel, we will study to keep water flowing continuously by devising materials and surface processing. Next, we study the method of self-supply of water and the method of installation of devices. Finally, the selection of the piezoelectric element

used for power generation is performed, the amount of generated power is evaluated, and the study for practical use is performed.

Graphical Abstract:

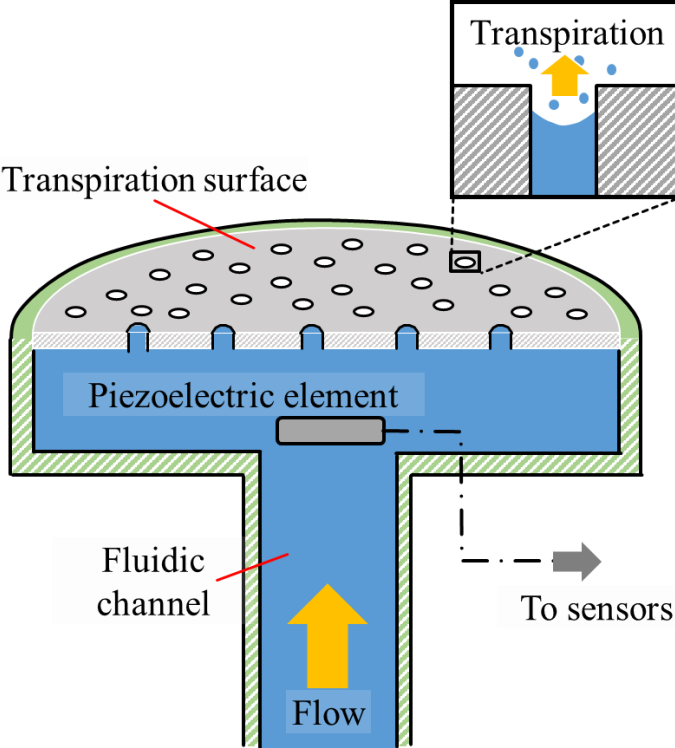


Fig. 1 Schematic of power generator device using piezoelectric element and transpiration