Special Issue on On-Site Energy

Preface

On-site energy has two important aspects. One is environmental and energy cycles. On-site energy systems usually convert low-density energy in the vicinity of a local spot, such as mechanical energy, thermal energy, and optical energy, into electricity. The size of on-site energy systems is from several meters to nanometers. Those with a size of several meters can be applied to local energy systems. On the other hand, those of micrometer scale can be applied to microdevices. Neither requires fuel or wires, considerably reducing the need for cables and batteries and contributing to resource conservation and an energy-saving society. The other important aspect is micro- and nanodevices. On-site energy is a key technology in modern electronics, robotics, medical science, and other related fields. The increasing demand for distributable micropower supplies for smartphones, personal computers, and artificial organs exemplifies the importance of on-site energy. On-site energy systems of micrometer scale are essential to the Internet of Things (IoT), which will create new styles of business and services. If we use a commercial grid power source, we would need wires to connect devices, which can lead to high cost for the wiring and the degradation of beautiful views. If we use batteries, we must change or charge them regularly, which also leads to high cost. In addition, batteries might be disposed in an illegal manner.

In this special issue, we will review the state-of-the-art research and development of on-site energy systems. Stimulating topics range broadly from materials development, device structure, microfabrication, evaluation, and analysis to on-site energy systems, peripheral devices, and circuits.

Articles S&M 2272, 2273, 2274, and 2275 deal with materials and fabrication processes for on-site energy. Articles S&M 2276, 2277, 2278, 2279, and 2280 deal with devices and microfabrication processes for on-site energy. Articles S&M 2281 and 2282 concern on-site energy systems.

Lastly, it is my hope this field will become increasingly popular, leading to the development of truly efficient environmental and energy cycles. In addition, IoT devices with on-site energy in the fields of medical care, environmental preservation, security, and safety will cause new services and businesses to flourish. I would also like to thank the reviewers and Ms. Tomoko Tanabe of MYU K.K. for their kind support in the publication of this special issue.

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