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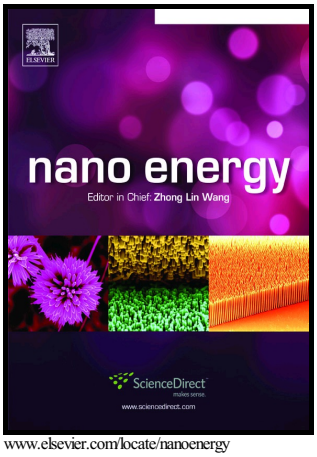

www.elsevier.com/locate/nanoenergy

PII: S2211-2855(15)00498-X
DOI: http://dx.doi.org/10.1016/j.nanoen.2015.12.021
Reference: NANOEN1076

To appear in: *Nano Energy*

Received date: 30 September 2015
Revised date: 14 December 2015
Accepted date: 22 December 2015

Cite this article as: Dongjin Jang, Younghoon Kim, Tae Yun Kim, Kunsuk Koh, Unyong Jeong and Jinhan Cho, Force-Assembled Triboelectric Nanogenerato with High-Humidity-Resistant Electricity Generation Using Hierarchical Surfac Morphology, *Nano Energy,* http://dx.doi.org/10.1016/j.nanoen.2015.12.021

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Abstract

We introduce a novel, robust, cost-effective, and scalable approach for the preparation of a large-area force-assembled triboelectric nanogenerator (FTENG), which allows a stable and high electric output under a wide range of humidity conditions through its dual-sized morphology (i.e., microstructures and nanostructures). In this study, hexagonally packed colloidal arrays prepared by a force assembly approach rather than by conventional self-assembly were used as a mold for a triboelectric poly(dimethylsiloxane) (PDMS) replica with desired pattern shapes (intaglio and embossed structures) and sizes. The morphological size of the PDMS films was determined by the diameter of the force-assembled colloids. The electrical output performance of FTENGs composed of electrodes and a PDMS film increased substantially as the size of the micropores (for intaglio-structured PDMS) or