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Solution Processable Organic Solar Cell Microarrays for Use in MEMS[1] JENNIFER TRINH, Swarthmore College, JASON LEWIS, PATRICK TOGLIA, XIAOMEI JIANG, University of South Florida — We have developed an innovative way to fabricate organic solar arrays for application as DC power supplies in electrostatic MEMS devices. The generation 1 microarray consists of 20 small (1 mm^2) solar cells connected in series (total device area of 2.2 cm^2). The device uses an active layer of poly(3-hexylthiophene) (P3HT) and [6,6]-phenyl-C61-butyric acid methyl ester ($PC_{61}BM$), which are mixed together (1:1 mass ratio) in appropriate solvent. We manipulated active layer nanomorphology by choice of solvents and annealing conditions. The optimized generation 1 device has an open-circuit voltage of 11.5V, short-circuit current density of 1 mA/cm^2, and a power conversion efficiency of 2% under simulated solar AM1.5 illumination. The generation 2 microarray has a new design with reduced series resistance and improved cell occupancy. The generation 2 arrays have demonstrated improved device efficiency and power output density. Detailed analysis of device physics in both generation microarrays will be presented. The procedure described has potential for producing microarrays as small as 0.01 mm^2.

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Jennifer Trinh
Swarthmore College

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