Abstract Submitted
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High Resolution Nanoimprint of Organic Photovoltaics with Bulk Metallic Glass Molds[1] MANESH GOPINADHAN, JONATHAN SINGER, ZHEN SHAO , SU HUANG, JAN SCHROERS, CHINEDUM OSUJI, Yale University, New Haven, Connecticut 06511, USA — Bulk heterojunction (BHJ) architectures are highly desirable for photovoltaic applications, with ideal ordered BHJ sample geometries consisting of domain sizes for the donor and acceptor commensurate to the exciton diffusion length (about 20 nm) and thicknesses on the order of hundreds of nm. Many demonstrations of OBHJ rely on expensive top down approaches for generation of the nanostructure. Bulk metallic glasses (BMGs) enable affordable replication of expensive hard masks at feature sizes and aspect ratios unachievable by other template materials and can be reused multiple times to achieve sub-100 nm imprint. We demonstrate the optimization and application of amorphous aluminum oxide-templated BMG nanoimprint to enable two sorts of photovoltaic geometry: (1) a nanostructured BMG electrode imprinted directly into phase separated, nanoconfined BHJ of poly(3 hexylthiophene-2,5-diyl) (P3HT) and Phenyl-C61-butyric acid methyl ester (PCBM) and (2) an ordered BHJ of P3HT and PCBM with conventional electrode performed by imprint into P3HT, removal of the template, and subsequent orthogonal cospinning of PCBM into the template. We demonstrate repeated generation of sub-100 nm feature size patterns with aspect ratios exceeding 3.

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