Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Morphology optimization for enhanced performance in organic photovoltaics OLGA WODO, JAROSLAW ZOLA, State Univ of NY - Buffalo, BASKAR GANAPATHYSUBRAMANIAN, Iowa State University — Organic solar cells have the potential for widespread usage due to their low cost-per-watt and mechanical flexibility. Their wide spread use, however, is bottlenecked primarily by their low solar efficiencies. Experimental evidence suggests that a key property determining the solar efficiency of such devices is the final morphological distribution of the electron-donor and electron-acceptor constituents. By carefully designing the morphology of the device, one could potentially significantly enhance their performance. This is an area of intense experimental effort that is mostly trial-and-error based, and serves as a fertile area for introducing mechanics and computational thinking. In this work, we use optimization techniques coupled with computational modeling to identify the optimal structures for high efficiency solar cells. In particular, we use adaptive population-based incremental learning method linked to graph-based surrogate model to evaluate properties for given structure. We study several different criterions and find optimal structure that that improve the performance of currently hypothesized optimal structures by 29%.

Olga Wodo
State Univ of NY - Buffalo

Date submitted: 13 Nov 2014 Electronic form version 1.4