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Mode delocalization in all-polymer distributed Bragg lasers YEHENG WU, ROLFE PETSCHEK, KENNETH SINGER — Photon localization in photonic crystals has received considerable attention during the last decade. Such wave localization arises from disorder inside the structure. At the same time, roll-to-roll processing for new generations of electronic and photonic devices and systems is currently a major motivation for research into organic and polymeric materials. An all-polymer distributed Bragg laser (DBR) includes two co-extruded multilayer polymer mirrors that exhibit considerable variation in layer thickness. It is well-known that the spacing of the longitudinal modes in a laser is related to the cavity length. Here, we report on measurements of mode penetration into the multilayer film within the bandgap. From transfer matrix simulations, we can determine how the localization length depends on lattice disorder. Simulations and studies of the ensemble average were able to connect the gap-delocalized modes to localized modes outside of the gap arising from Anderson localization, as well as identify the controlling parameters. In addition, FDTD simulations confirmed our results.

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