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Effect of mechanical deformation on the electrical properties of organic single crystals MARCOS REYES-MARTINEZ, ALFRED CROSBY, ALEJANDRO BRISENO, University of Massachusetts Amherst — Despite efforts in the flexible electronics field, relatively little research quantified the effects of mechanical strain on the electrical properties of organic single crystals (OSCs) and their device performance in deformed geometries. Single crystals of organic semiconductors are ideal systems for the elucidation of these effects without having to account for imperfections, grain boundaries and other defects. The aim of this presentation is to bring new understanding of the effects of mechanical strain in charge transport phenomena on OSCs. First, the existence of a piezoresistive effect in rubrene crystals is demonstrated and experimentally quantified by the application of in-plane strain along its [010] axis. A piezoresistive coefficient approximately 50 is determined. Second, the effect of local mechanical deformation on the conductive channel is investigated in rubrene single-crystal field-effect transistors. A wrinkling instability is used as a technique to apply local strains of different magnitudes to the conducting channel of field-effect transistors. All devices maintain excellent transistor behavior, and small, reversible changes in performance are observed during wrinkling. This work provides useful knowledge for the effective application of organic semiconductors in strain intensive applications such as pressure sensors, electronic skins and strained-channel organic transistors.

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