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Investigating void development in filled elastomers under uniaxial strain AILISH O'HALLORAN, National University of Ireland Galway, ARTHUR SCHOLZ, University of California Santa Barbara, KRISTIN SCHMIDT, Univeristy of California Santa Barbara, LIXIA RONG, Brookhaven National Laboratory, SHIGEYUKI TOKI, BENJAMIN HSIAO, Stony Brook University, ED KRAMER, University of California Santa Barbara — Development of voids during cyclic, uniaxial extension and retraction, of both silica and resin filled elastomers, was studied by combining synchrotron-based time resolved small angle X-ray scattering (SAXS) and primary X-ray beam attenuation with stress-strain curves measured simultaneously. These data were used to calculate the volumetric strain due to the development of voids during extension and their subsequent disappearance during retraction as well as the size and shape of the smaller voids. Four samples were investigated, one silica-filled polydimethylsiloxane (PDMS), one resin filled PDMS, and two silica filled polyphenylmethylsiloxane (PPMS), all candidate materials for dielectric elastomer actuators, in which void development would lead to decreased dielectric breakdown electric fields and premature failure.

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