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Optical birefringence in Compressed Aerogels[1] P. BHUPATHI, J. HWANG, R. M. MARTIN, L. JAWORSKI, D. B. TANNER, Y. LEE, Department of Physics, University of Florida, Gainesville, FL 32611, J. BLANKSTEIN, Alexander W. Dreyfoos School of the Arts, West Palm Beach, FL 33401, N. MULDERS, Department of Physics and Astronomy, University of Delaware, Newark, DE 19716
— We performed optical birefringence measurements on 98% porosity silica aerogel samples subjected to various degrees of uniaxial compression up to 15% strain over a wide range of wavelength, 200 to 800 nm. Silica aerogels are composed of an entangled network of 3 - 5 nm diameter SiO_2 strands and can be synthesized in a wide range of porosity, especially in the high porosity limit close to 99.9%, yet maintaining good mechanical stability. Uncompressed aerogels exhibit no or minimal degree of birefringence, indicating the isotropic nature of the material. Uniaxial compression of aerogel introduces global anisotropy, which produces optical activity in the material. We observed a quasi-linear strain dependence in $|\Delta n| = |n_e - n_o|$ in compressed aerogels, where $n_{e(o)}$ is the index of refraction for the extraordinary (ordinary) ray which has its polarization parallel to the compression axis. This effect has potential applications for aerogels as tunable waveplates operating in a broad spectral range.

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