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Brillouin light scattering studies on the mechanical properties of ultrathin, porous low-K dielectric films WEI ZHOU, R. SOORYAKUMAR, The Ohio State University, SEAN KING, Intel Corporation — Low K dielectrics have predominantly replaced silicon dioxide as the interlayer dielectric material for interconnects in state of the art integrated circuits. To further reduce interconnect resistance-capacitance (RC) delays, additional reductions in the K for these low-K materials is being pursued by the introduction of controlled levels of porosity. The main challenge for porous low-K dielectrics is the substantial reduction in mechanical properties that is accompanied by the increased pore volume content needed to reduce K. We report on the application of the nondestructive Brillouin light scattering technique to monitor and characterize the mechanical properties of these porous films at thicknesses well below 200 nm that are pertinent to present applications. Observation of longitudinal and transverse standing wave acoustic resonances and the dispersion that accompany their transformation into traveling waves with finite in-plane wave vectors provides for the principal elastic constants that completely characterize the mechanical properties of these porous films. The mode amplitudes of the standing waves, their variation within the film, and the calculated Brillouin intensities account for most aspects of the spectra. The resulting elastic constants are compared with corresponding values obtained from other experimental techniques.

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