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Phonon Propagation in Dry and Wet Polystyrene Opals GEORGE FYTAS, Max Planck Institute for Polymer Research, P. O. Box 3148, 55128 Mainz, Germany and FO.R.T.H P.O.Box 1527 71110 Heraklion ,Greece, WEI CHENG, JIAN JUN WANG, ULRICH JONAS, Max Planck Institute for Polymer Research, P. O. Box 3148, 55128 Mainz, Germany — The phononic properties of fabricated soft opals consisting of closely packed spherical submicrometer polystyrene particles were investigated by Brillouin light scattering in the GHz frequency range. In air, the numerous modes found in the dry opal are theoretically identified as the particle eigenmodes using the two elastic constants for the bulk polystyrene. The line shape of the low-frequency modes can be utilized as an index of the particle size polydispersity and a sensitive probe for monitoring the latex film formation. Unlike for the dry opal, the study of the propagation of acoustic waves in the infiltrated (by silicon oil) opal for wave vector $k_{||}$ parallel to the fcc (111) planes of the slab has revealed two modes: an effective medium mode with linear dispersion over the examined $k_{||}$ range and a second mode the dispersion of which depends on the direction of $k_{||}$ relatively to the symmetry lines of the Brillouin zone. The experimental dispersion will be compared with phononic band structure calculations.

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