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Light Propagation in Colloidal Glass: enhancement of scattering at reduced coordination number XIAOTAO PENG, A.D. DINSMORE, UMASS Amherst — We measure the propagation of light through random films of strongly-scattering microspheres as a function of the mean number of contacts per particle (the coordination number, Z). Two kinds of colloidal spheres are mixed to prepare dried films with random structure. Latex spheres coated with a high-index ZnS are mixed in various ratios with PMMA spheres and the PMMA spheres are then dissolved by acetone. The transport mean-free path of light l^* is then extracted from measurements of coherent backscattering of light from the films. We found a minimum of $l*$ (maximum of scattering) occurs around Z=4, not in a close-packed film (Z$\sim$11), which is counterintuitive. In a simple mean field model, decreasing Z reduces the local average refractive index and enhances the optical contrast of each scattering sphere with the effective background, thus reducing l^*. These results may guide our understanding of the propagation of waves in random media in general and may lead to new photonic materials. This work is supported by the NSF-sponsored UMASS MRSEC. A.D.D is a Cottrell Scholar of the Research Corporation.

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