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Deformation Studies and Elasticity Measurements of Hydrophobic Silica Aerogels using Double Exposure Holographic Interferometry[1]

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— Holographic interferometry is mainly used for the non-destructive testing of various materials and metals in industry, engineering and technological fields. This technique may used to study the elastic properties of materials. We have used the double exposure holographic interferometry (DEHI) to study the surface deformation and elastic constant such as Young's modulus of mechanically stressed aerogel samples. Efforts have been made in the past to use non-destructive techniques like sound velocity measurements through aerogels. Hydrophobic Silica aerogels were prepared by the sol-gel process followed by supercritical methanol drying. The molar ratio of tetramethoxysilane: methyltrimethoxysilane: H_2O constant at 1.2:0.8:6 while the methanol / tetramethoxysilane molar ratio (M) was varied systematically from 14 to 20 to obtain hydrophobic silica aerogels. After applying the weights on the sample in grams, double exposure holograms of aerogel samples have been successfully recorded. Double exposure causes localization of interference fringes on the aerogel surface and these fringes are used to determine the surface deformation and elastic modulus of the aerogels and they are in good agreement with the experiments performed by using four point bending.

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