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Deformation and damage in silica aerogels during fluid filling[1] TOBIAS HERMAN, JOHN BEAMISH, University of Alberta — Interfaces are present throughout any porous medium during fluid adsorption below the liquid-vapor critical point. Surface tension in these curved liquid-vapor interfaces produces the pressure difference between the two phases which is responsible for capillary condensation. The surface tension also exerts a force on the solid, although it is usually much smaller than the elastic moduli of the porous medium. Aerogels, however, have extremely small elastic moduli so surface tension induced deformation can be significant and even destructive. We present measurements of the dilation and compression of two silica aerogels (densities 110 and 51 kg/m^3) during adsorption and desorption of low surface tension fluids (helium and neon). The denser aerogel changed its length by up to 2% during adsorption of helium, still within its elastic regime; the lighter aerogel shrank by even larger amounts and appeared to sustain permanent damage.

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