

Abstract Submitted
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Glasses, Stress, Attenuation and Thermal Conductivity¹ JIAN-SHENG WU, CLARE YU, University of California, Irvine — A wide variety of amorphous materials exhibit similar behavior in their thermal properties. Examples include universal features in the specific heat, thermal conductivity, and ultrasonic attenuation. Recent experiments from the Parpia group at Cornell find that high stress silicon nitride thin film resonators exhibit a remarkably high Q factor, exceeding that of amorphous SiO₂ by 2 to 3 orders of magnitude over a broad range of temperatures, and even exceeding that of single crystal silicon at room temperature. We present a model of why the stress reduces the attenuation. The basic assumption is that high stress increases the potential barriers of the excitations of defects that produce the loss, thus reducing the effective density of lossy fluctuators. We predict that high stress could lead to high thermal conductivity and low dielectric loss, making high stress SiN an excellent candidate as a substrate for integrated circuits.

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