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Surface elastic waves on a viscoelastic boundary generated by an oscillating microbubble[1] MARC TINGUELY, MATTHEW HENNESSY, ANGELO POMMELLA, OMAR MATAR, VALERIA GARBIN, Imperial College London — Acoustically-driven microbubbles are used as contrast agents for ultrasound medical imaging, or to enhance the uptake of molecules by cells in drug delivery. For both applications, the microbubbles oscillate near soft interfaces, whose viscoelastic properties vary depending on neighbouring tissues. The effect of these properties on the deformation of the boundary, and on the stresses generated by the microbubbles, is still poorly understood. We use high-speed video microscopy to investigate the deformation of agarose gels of controlled viscoelastic properties by an oscillating microbubble via tracking the displacement of embedded particles. We observe the propagation of surface elastic waves (Rayleigh waves) whose velocity of propagation, phase shift, and particle trajectories depend on the viscoelastic properties of the boundary. We develop a Kelvin-Voigt viscoelastic model to predict the deformation of the gels. The results of the model are in good agreement with the experimental observations, which permits the estimation of the magnitude of the stresses generated on the surface of the gel by the oscillating bubble.

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