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Third Sound in Superfluid ^{4}He Films Adsorbed on Packed Multiwall Carbon Nanotubes[1] EMIN MENACHEKANIAN, GARY A. WILLIAMS, University of California, Los Angeles — An investigation of third-sound propagation is carried out with thin ^{4}He films adsorbed on multiwall carbon nanotubes. At an average diameter of 12 nm and a length of several microns, the powder of nanotubes is lightly packed into a cylindrical resonator, with a resistor bolometer at the cylinder end to detect the temperature oscillations accompanying the waves. The lowest standing-wave mode in the cavity is excited by mechanical vibrations, with FFT analysis allowing measurement of the sound speed as well as the dissipation. The Kosterlitz-Thouless onset transition is observed with increasing film thickness for temperatures between 1.3 and 1.7 K. At higher thicknesses capillary condensation becomes important, probably at connection points where the nanotubes touch. Layering effects in the third-sound velocity, associated with the relatively strong van der Waals coupling between helium and carbon, are not observed, and measurements below 1 K may be necessary to see this. There is also no indication of any effect of superfluidity attributable to the adsorption of helium on the inner surfaces of the nanotubes.

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