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Dynamical properties of single crystalline 4H-SiC micro-cantilevers and determination of Poisson's ratio and density of 4H-SiC thin film FENG ZHAO, ALLEN LIM, QUAN TRAN, School of Engineering and Computer Science, Washington State University Vancouver — As a wide bandgap semiconductor, single crystalline 4H-polytype silicon carbide (4H-SiC) is a very attractive material for microelectromechanical systems (MEMS) with operation in harsh environments such as high temperature, radiation, chemical/biomedical, etc. Fabrication and performance prediction of 4H-SiC MEMS require releasing of thin films as well as an accurate value of its important material properties including density and Poisson's ratio. However, releasing single crystal 4H-SiC microstructures is extremely challenging due to the very inert chemical resistance of 4H-SiC (practically only etched by molten KOH above 600 °C). Although density and Poisson's ratio in bulk 4H-SiC form have been known, they may not be the same in thin film with the thickness in the order of micrometers for MEMS systems. In this paper, we successfully released single crystal 4H-SiC to fabricate suspended micro-cantilever structures using a recently developed surface micromachining technique. The dynamical properties of these cantilevers including resonant frequency and force-distance were characterized, from which the density and Poisson's ratio of 4H-SiC thin film were determined.

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