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Tension in the Initial Growth Stages of Sputter Deposited WSi_2 on Si in Multilayers[1] ALBERT MACRANDER, Argonne, KIMBERLEY MACARTHUR, Argonne/NIU, BING SHI, Argonne, RAY CONLEY, ANL/BNL — We concentrate on the initial stages of growth of sputtered amorphous multilayers with equal WSi_2 and Si layer thicknesses of 5.5 nm, and we report observations of tension in the first 1.1 nm of WSi_2 grown on Si layers. Measurements of wafer curvature were made *in-situ* in the sputtering chamber. Stresses in the conjugate interface of Si on WSi_2 were observed to be significantly smaller. A clear asymmetry in the stress of these conjugate interfaces rules out an explanation based solely on lattice misfit. We find a value of 1.3 x 10^{10} dynes/cm^2 for the biaxial film stress at the WSi_2 on Si interface grown at 2.3 mTorr of Ar pressure, a value comparable to values calculated for hybridization of Si(111) facets by various adatoms [1]. Our observations thereby support a model for chemically induced changes in packing density during sputtering of the interfaces. As an example of a particular application, WSi_2/Si multilayers consisting of many hundreds periods have been used to make lenses for nanofocusing of hard x-rays [2-3].
[1] D. Vanderbilt, PRL 59, 1456 (1987). [2] H.C. Kang et al. PRL 96, 127401 (2006); APL 92, 221114 (2008). [4] L. Zhou et al. PRB 82, 075408 (2010).

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