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Monotonic and fatigue tests of amorphous silicon nanostructures using atomic force microscope[1] CHURAMANI GAIRE, D.-X. YE, T.-M. LU, G.-C. WANG, Dept. of Physics, Rensselaer Polytechnic Institute, Troy, NY, C. R. PICU, Dept. of Mech. Engg., Rensselaer Polytechnic Institute, Troy, NY — The plastic deformation and the failure properties of a-Si slanted nanostructures (one- and two-armed) fixed at one end to the substrate, grown by oblique angle physical vapor deposition, have been studied with the use of AFM. Monotonic loading/unloading tests were carried out to determine the elastic and plastic failure properties. We also developed the fatigue test methodology suitable for nanoscale specimens with the use of AFM. The AFM was used for imaging (to locate) as well as for loading the structures in monotonic bending and force (stress) controlled cyclic loading/unloading mode until the specimen failed completely. A novel way was used to identify the failure of the specimens during the fatigue test. The post-test analysis of the failure surface was done through SEM imaging. The possible inhibition of the brittleness of the a-Si samples with the reduction of the size and damage evolution during fatigue test on the nanoscale specimens will also be discussed.

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Churamani Gaire
Dept. of Physics, Rensselaer Polytechnic Institute, Troy, NY

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