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The effect of hydrogen on the radiation-enhanced viscosity of amorphous silicon. JEAN-FRANCOIS JOLY, SJOERD ROORDA, NORMAND MOUSSEAU, LAURENT LEWIS, Universite de Montreal — It has long been known that ion bombardment reduces the viscosity of disordered solids by many orders of magnitude. The exact explanation for this phenomenon has not yet been found but defect generation and defect mobility under ion bombardment is expected to have an important effect on the physical properties of materials. Since hydrogen increases the stability of disordered networks by bonding to dangling bonds, its presence should therefore lead to an increase of the radiation-enhanced viscosity of a-Si by reducing the mobility of defects. A characterization of the effect of H on the mobility of these defects could therefore enable a deeper understanding of the nature of defects in amorphous silicon. In this work, we investigate the role of H at concentrations up to 3.5 at. %, injected in amorphous silicon layers 1,4 um thick made by 1 MeV self-ion implantation. The samples were initially set in different states of stress and annealed at 475 C, then bombarded by 1 MeV Si+ ions to induce viscous flow. The subsequent stress reduction was measured from in-situ curvature measurements. Results indicate that the viscosity increases with hydrogen content. This suggests that defects containing dangling bonds, like vacancies, are responsible in part in enabling large scale mass transport in amorphous silicon.

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