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Yielding and plastic processes in amorphous materials under tension JOYJIT CHATTORAJ, EMANUELA DEL GADO, Georgetown Univeristy, Department of Physics, Washington DC, C. COREY HARDIN, Division of Pulmonary and Critical Care Medicine, Massachusetts General Hospital, Boston, MA, RAMASWAMY KRISHNAN, Center for Vascular Biology Research, Beth Israel Deaconess Medical Center, Boston, MA — We use numerical simulations of a simple particle model to investigate the non-linear response of amorphous solids to tension and identify a yielding regime associated with high deformation rates. Such regime seems to be associated to a toughening mechanism which is directly related to the emergence of plastic processes and concurrent growth of large but limited gaps. We have characterized the spatio-temporal correlations of the plastic events and recognize several distinctive features similar to the redistribution of the long ranged elastic strain field detected in amorphous solids under shear. We have also found that the gap growth is associated to a progressive alignment of local tensions and that gaps preferentially grow at the interfaces of aligned domains which are basically the locations of orientational stress defects. Interestingly, such findings can be compared with recent experiments on the mechanics of monolayers of endothelial cells, that form semi-permeable inner surfaces of blood vessels, providing new possible hints on its functioning.

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