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A molecular model for toughening in double-network hydrogels WEN-LI WU, VIJAY TIRUMALA, NIST, TAIKI TOMINAGA, Hokkaido University, SANGHUN LEE, PAUL BUTLER, ERIC LIN, NIST, JIAN PING GONG, HIDEMITSU FURUKAWA, Hokkaido University — A molecular mechanism is proposed for the toughness enhancement in double network (DN) hydrogels prepared from poly (2acrylamido, 2-methyl,1-propanesulfonicacid) (PAMPS) polyelectrolyte network and polyacrylamide (PAAm) linear polymer. It is an extension of the phenomenological model set forth recently by Gong *et al.* This mechanism takes into consideration all the observed changes in molecular structure of the constituents via *in-situ* small angle neutron scattering (SANS) measurements, the composition dependence of the solution viscosity and the thermodynamic interaction parameters of PAMPS and PAAm molecules from our previous neutron scattering studies. More specifically, this proposed mechanism provides an explanation of the observed periodic compositional fluctuation in the micrometer range induced by large strain deformation.

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