**In situ Alteration of Filler Structure and Development of Mechano-adaptive Rubber**

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Abstract:

Mechanically switchable materials are a class of smart materials which can be used to reversibly change its mechanical properties with stimuli like electricity, water, magnetic field, solvents etc. New strategies have been attempted to design a mechanically switchable elastomer composites that can be stimulated by water. The developed strategies have decoded some of the challenges in developing stable hydrophilic elastomer composites, functional filler which will stimulate the mechanical switchability and its homogenous distribution in to the elastomer matrix. In order to decipher the challenge of hydrophilicity in elastomers, we have developed a compatible blend of epichlorohydrin-ethylene oxide-allyl glycidyl ether (GECO) and hydrophillic polymer ethylene oxide- propylene oxide-allyl glycidyl ether (GEPO). Specifically, calcium sulphate is chosen as the functional filler for achieving mechanical switchability due to its inherent ability to reversibly change the morphology and its crystal structure when it comes in contact with water. Mechanical switchability is realized by the reinforcement caused when the composite is exposed to water treatment process and further, this process can be brought back to its initial state (unreinforced state) by heat treatment process. The reversible nature of reinforcing and non-reinforcing nature of filler particles on water and heat treatment has been characterized with the help of change in the crystal structure and morphology of the calcium sulphate particles which can be understood from X-ray diffraction, Raman spectroscopy and SEM images.