Fatty Acid Swollen Natural Rubber Shape Memory Polymers

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Shape memory polymers (SMPs) are a type of material capable of indefinitely holding a deformed shape and recovering their original shape upon the application of an external stimulus, such as temperature. SMPs contain at least two networks consisting of a permanent crosslinked polymer matrix and a second reversible, shape fixing network. These networks could be chemically bonded in single chemistry systems such as block copolymers containing elastic and glassy or crystalline phases or be blended together through elastomer and crystalline small molecule mixtures.

In this study, fatty acid swollen natural rubber shape memory polymers were investigated as a function of swelling extent, acid polarity, and applied deformation. The fatty acid-rubber systems demonstrate a 40-50 wt% effective fatty acid solid phase loading range where the fixity of a programmed shape remained > 95% while maintaining structural integrity. The strength of the crystalline fatty acid networks were determined through dynamic mechanical analysis (DMA) moduli measurements where, under large uniaxial deformations, the modulus of the fatty acid was found to increase compared to the unstrained material. This was consistent with preferential alignment of crystal platelets along the strain direction as determined by small angle X-ray scattering (SAXS) measurements.

Biography:
Marcos Pantoja received his B.S. in Chemical Engineering form UCLA in 2014. As an undergrad, Marcos participated in the University of Akron’s College of Polymer Science and Polymer Engineering (CPSPE) Research Experience for Undergraduates (REU) program, an experience which encouraged him to pursue a graduate degree. Marcos recently completed his Ph.D. from the Department of Polymer Engineering at the University of Akron under the guidance of Kevin Cavicchi where he researched compounding strategies of fabricate shape memory polymers.