Analysis of Mechanical Properties Poly(methyl methacrylate) Hydrogel

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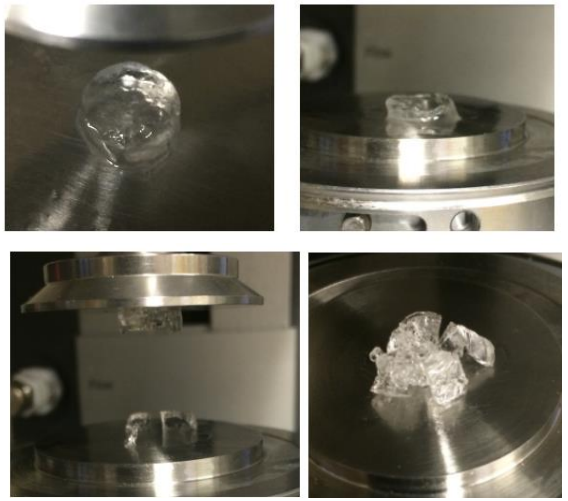
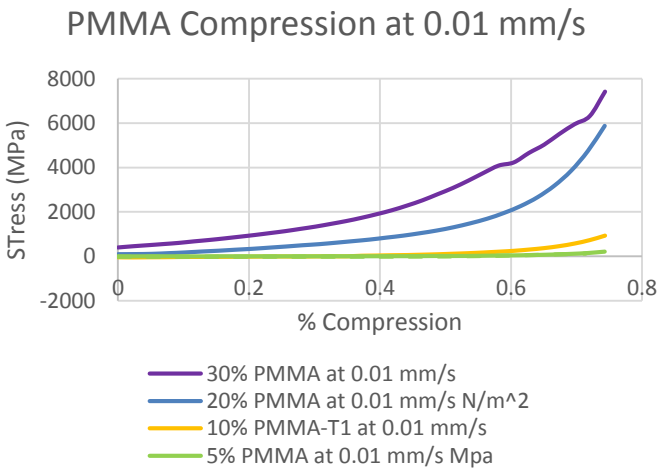
Project Overview The purpose of this project was to identify the mechanical properties of water-swollen gels made from a polymer typically used to make hard plastics. In low concentrations, this material behaves as a complex liquid, or one exhibiting properties of both a solid and a liquid. These characteristics are commonly found in nature, and make hydrogels a promising material for tissue engineering. It was hypothesized that as polymer concentration increased in a gel, it would behave more like a solid. Gels of different concentrations were prepared and compression tests performed to evaluate the mechanical strength of gels. It was found that the percent compression at which fracture occurred was independent of concentration, but dependent on speed of compression. The data indicates that all gels deform when compressed 44.76% at a rate of 0.01 mm/s, and 28.58% when compressed at 0.05 mm/s. The elastic response of a gel, however, is indicated by the rate at which it approaches its fracture point; the lowest concentration gel (5%) deformed gradually, with a slope of 70.72 (MPa / %Compression), compared to the 30%wt. gel with a slope of 3496 (MPa/ %Compression).



5%wt (top) and 30%wt(bottom) gels after compression



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