

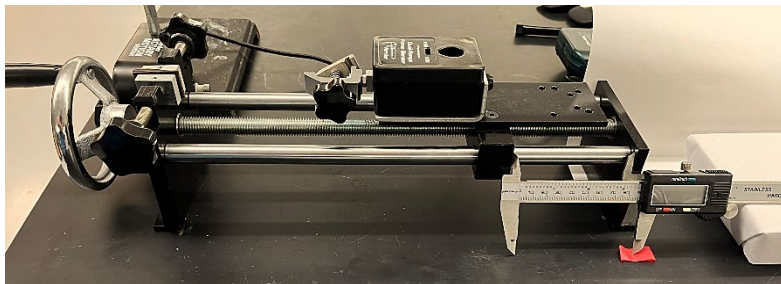
Impact of Personal Care Products on Tensile Strength and Structure of Hair

Jordan Kunze, Matthew A. Ray*

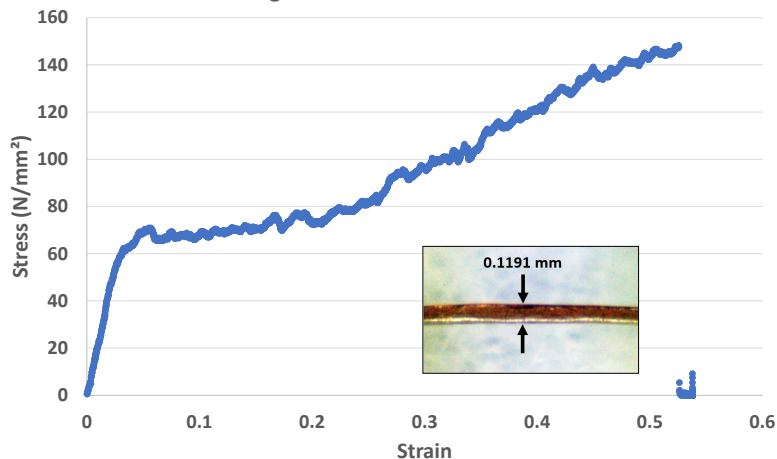
Department of Chemistry and Physics, University of Wisconsin–Stout

Abstract

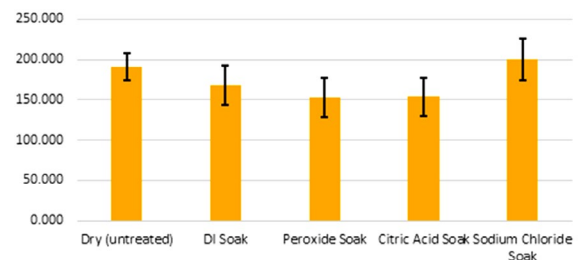
There is currently a lot of debate over hair products and the components within them. While sulfates and parabens have been the two most controversial components within hair products, there is very little public knowledge regarding how other common chemical components impact hair. The purpose of this research is to explore the chemical components citric acid, hydrogen peroxide, and sodium chloride found in shampoo specifically and evaluate the impacts that each of these chemical components can have on hair. This was quantified through measuring changes in tensile stress and strain after chemical treatment when compared to the initial dry hair and a deionized (DI) water soak control. A high-resolution tensile tester capable of measuring the strength of a single hair was constructed from commercially available components and sensors. The diameter of each hair was determined by optical microscopy after chemical treatment. Based on the results of this study, it does appear that there are measurable changes in hair strength and elasticity after some of the chemical interactions tested. Samples exposed to hydrogen peroxide and citric acid showed the greatest decrease in tensile strength while sodium chloride appeared to have a strengthening effect. Samples soaked in deionized water showed a marked increase in elasticity and elongation at break while exposure to sodium chloride decreased the observed elongation at break when compared to the dry untreated control. Further research needs to be done to elucidate the significance and repeatability of the observed effects.



Single Hair Stress-Strain Curve



Ultimate Tensile Strength (N/mm²)



Elongation at Break

