



CALIFORNIA SCIENCE & ENGINEERING FAIR 2019 PROJECT SUMMARY

Name(s) Kelly Pham	Project Number S0618
Project Title The Effect of pH on the Adsorption Capacity of Wool	
<p style="text-align: center;">Abstract</p> <p>Objectives The objective of this project is to investigate the effect of acidity on the dye sorption of the animal fiber wool.</p> <p>Methods Dyebaths of various vinegar concentrations were prepared, to which Red 40 dye was added, little by little. A spectrophotometer was utilized to find the absorbance of each dyebath at various the concentrations of dye to create a calibration curve, which is based on the principle defined by the Beer-Lambert Law. Microsoft Excel was used to find a calibration equation. This was repeated for each vinegar solution and for each trial (8 total trials). During the dyeing process, the spectrophotometer was used to find the absorbance of each dyebath in half-hour intervals. This data was plugged into each calibration equation to find the concentration of dye adsorbed, which was then used in an equation to find the adsorption capacity of each piece of wool.</p> <p>Results The data shows that the adsorption of dye by wool was more effective in dyebaths with a lower pH value. The adsorption capacity of wool was found to be directly related to the concentration of acid in the dyebath, rather than to the pH.</p> <p>Conclusions Higher adsorption capacity in wool indicates more efficient dyeing. Since wool adsorption capacity increases as pH of the dyebath decreases, it can be concluded that acidity and basicity of the dyebath can be manipulated to achieve better fabric coloring. The implications of this project are most applicable to the competitive textile industry, since understanding the relationship between pH and dye efficiency can allow for more cost-effective use of dyes. This project is also useful in transforming the textile industry into a more environmentally-friendly industry, since dyes used in the coloring process sometimes contain heavy metals which are difficult to eliminate.</p>	
Summary Statement This project explores the relationship between pH of the dyebath and efficiency of dye in fabric coloring.	
Help Received Mr. Paul Hunt provided materials and gave advice; family offered moral support	