



**CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY**

Name(s) Reece T. Fenning	Project Number S0504
Project Title Silver Nanoparticles	
Objectives/Goals If TSC is increased in the solution, then the wavelength of visible light will increase because the size of the nanoparticle will increase. If PVP is increased, the wavelength of visible light emitted will decrease because the width of the nanoparticles will increase.	
Abstract Methods/Materials Materials: H ₂ O (solvent); AgNO ₃ (silver source, oxidizing agent); Sodium citrate tribasic (TSC) (surfactant); Poly vinyl pyrrolidone (PVP) (surfactant); H ₂ O ₂ (reaction controller); NaBH ₄ (Reducing agent); Precise Scales; Spectrometer; Vials; Mixing plates; Pipettes . Procedure Step 1 Place 25 mL of water into Erlenmeyer flask and on a stirring plate set stirring plate for 600 rpm Step 2 Add 50 microliters of AgNO ₃ into the solution Step 3 Add 1.5 mL of Sodium citrate tribasic Step 4 Add .3 mL of PVP into the solution Step 5 Add 60 microliters of Hydrogen Peroxide Step 6 Add 250mL of Sodium Borohydride Step 7 Wait 30min to 40min for the reaction to complete Note: The PVP and TSC are subject to change depending on the results we tried to obtain and different pipettes are used for each step.	
Results As more of the TSC is added, the wavelength absorbed increases and the color emitted tends to be a blue or purple. As more PVP is added, the wavelength absorbed decreases and the color of the solution changes to a yellow or red color.	
Conclusions/Discussion The hypothesis was proved to be correct. The PVP surfactant binds with the triangular bases, which helps prevent the length to grow. This corresponds with the wavelength range of usually 350 to 600 nanometers. The TSC binds with the square sides, which helps prevent the growth of the width. This causes the orientation of the silver nanoparticles to become very long with a skinny width and the wavelength ranges between 700 to 1000 nanometers. This experiment shows that the silver nanoparticles do not always act the same as the bulk material.	
Summary Statement This project is about observing the effects of certain surfactants on silver at the nano scale level.	
Help Received Dr. Yadong Yin and his graduate students helped me perform the experiment and helped explain what was occurring chemically.	