Introduction

Silver Nanoparticles have gained interest in recent years along with other polymer and nanometric metal particles. Known for its antibacterial uses, silver is used for dental operations and for burn wounds. The small size of the particles allows for antibacterial targeting in the body. The nanoparticles can be created using a variety of methods: spark discharging, electrochemical reduction, solution irradiating and cryochemical method. Solution chemistry provides ample control over size and shape. The particle shape and size are particularly important in the synthesis of the silver nanoparticles, as a differently sized and shaped particle offers different capabilities and uses. A reducing agent is used when creating the particles; in this case, polyvinylpyrrolidone (PVP). Since PVP is water-soluble, it is used in many pharmaceutical drugs to bind and coat the substance. It is also used similarly for silver nanoparticles. In this study, we are investigating the effect of PVP on varying silver concentrations.

Materials and Methods

- Silver Nitrate(AgNO3)
- PVP
- Acetone
- Beakers
- Magnetic Stirrers
- Graduated cylinder
- Water

METHOD: 4 different amounts of AgNO3 were measured (50mg, 100mg, 150mg, 200mg) and mixed into water. 40 mL of acetone was added to all the solutions and then magnetically stirred for 15 min. Once mixed, 2.0 grams of PVP were added to each sample, and then allowed to mix for 35 minutes. All 4 of the samples (50mg, 100mg, 150mg, 200mg) were dried at room temperature for almost 2 days; turning into an orange-black color. The 100mg and 150mg samples did not dry as well as the 50mg and 200mg samples. For UV-Vis, the samples were dissolved into ethanol; for XRD, the samples were crushed into a powder. For both TGA and TEM, very small samples were taken.

Results and Discussion

Fig. 1: UV-vis absorption spectra for different concentrations of AgNO3 in Ag/PVP nanoparticles

Fig. 2: UV-vis absorption peaks for each sample

Fig. 3: Curve of the TGA thermogram of Ag/PVP nanoparticles and 5% PVP showing weight loss

Fig. 4: XRD data shows presence of silver in the synthesized sample

Fig. 5: Particle size of Ag particles; those labeled ranging from 283-339nm

Fig. 6: Particle size of Ag particles; those labeled ranging from 209-359nm

Conclusion:

As the silver concentration was increased, the particles absorbed light at a shorter wavelength according to the UV-vis graph. The broadness of the peaks of each sample indicates larger particle sizes. As the peak gets narrower, particle size gets larger. In addition, the temperature needed to induce weight loss was higher as the silver concentration rose; as evidenced by the TGA data. This is due to silver’s higher resistance to heat; with a melting point of 961.8 °C. With more silver, the percent weight loss at certain temperatures is expectedly less.

Reference:


Acknowledgments

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