SYNTHESIS AND THERMOOPTICAL CHARACTERIZATION OF COPPER NANOPARTICLES

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Abstract

Research focused on the study of the synthesis and thermooptical characterization of copper nanoparticles (NPCu), using copper chloride ($CuCL_2 2H_2O$), ascorbic acid ($C_6H_8O_6$), hydrazine (HH $N_2H_4 \cdot H_2O$), sodium dodecyl sulfate (SDS), copper sulfate ($CuSO_4 5H_2O$) and sodium borohydride ($NaBH_4$). The characterization was done through plasmon resonance, using the UV-VIS spectroscopy technique.

Other ways to characterize NPCu are through infrared, transmission electron microscopy, and phase automodulation.

Introduction

Plasmon resonance (SANTOS, J. F. L. et al) is a phenomenon where the interaction between light and matter occurs (these nanoparticles are noble metals). It happens when light interacts with electrons, forming an electron cloud that oscillates and causes the wavelength to be absorbed and have a certain amplitude. Plasmon resonance can be analyzed using the UV-VIS spectroscopy technique and can be observed macroscopically by the solution staining.

Materials and Methods

The materials used in this research were glassware, ultrapure water, spatula, analytical balance, ascorbic acid, sodium borohydride, hydrazine, sodium dodecyl sulfate, copper chloride and copper sulfate.

The first NPCu synthesis solution contained 0.01M copper chloride for 500mL ultrapure water and 0.5M ascorbic acid for 150mL up water.

The second synthesis contained 12mM hydrazine, 0.145g SDS, and 0.068g copper chloride.

The last synthesis contained 0.02M of sodium borohydride for 50mL of up water and 0.02M of copper sulfate for 40mL of up water.

All solutions were magnetically stirred and UV-VIS spectroscopy measurements were made.

Results and Discussion

Each synthesis made had samples diluted in ultrapure water, being taken for analysis through UV-VIS spectroscopy, to detect a possible formation of an absorption curve. However, none of them obtained the expected curve, presenting instead a noisy spectrum, as shown in figure 1. As a result, it was not possible to obtain the wavelength value of the copper nanoparticles.

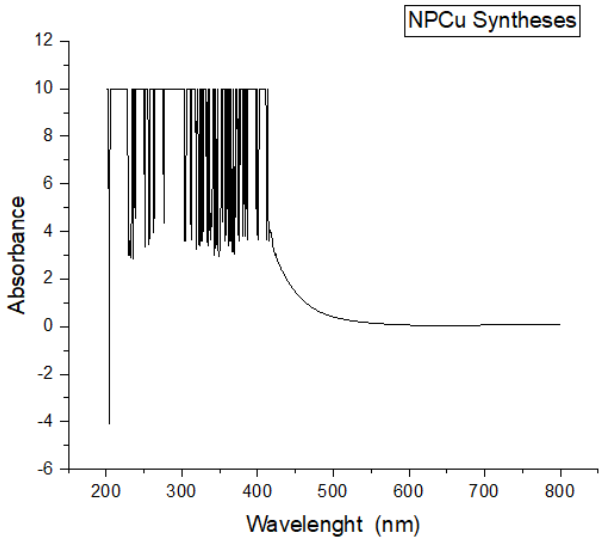


Figure 1. UV-VIS spectrum graph of copper nanoparticle synthesis.

Conclusion

It was not possible to obtain the expected result, as evidenced by the UV-VIS absorption curves, from the known optical response of the copper nanoparticles. At this time, it was not possible to identify the failure in the experimental procedure, and all the protocols applied were based on scientific articles published in recognized journals. Thus, the expected optical characterization of the synthesized material could not be carried out, and as this was the focus of the research because it was the area of interest, the other measurements that were expected to be made were not made.

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SANTOS, J. F. L. et al. Ressonância de plasmon de superfície localizado e aplicação em biossensores e células solares. 2016. Tese (Doutorado em Ciências e Materiais). – Universidade Federal do Rio Grande do Sul, Porto Alegre, 2016.