

Experimental report of experiment 25-01-869

“PHYSICAL CHARACTERIZATION OF SILVER NANOPARTICLES FOR THEIR USE AS ANTITUMORAL DRUG”

18 shifts were requested for experiment 25-01-869 and 6 shifts were allocated with the comment: “Very difficult experiments. Apart from the Ag oxidation state, it is not clear how authors want to study the way in which Ag performs its antitumor activity. 6 shifts are allocated for a test”. A related proposal, 25-01-871 “CHARACTERIZATION OF ANTIPROLIFERATIVE ACTIVITY OF Ag ON CANCER CELLS” was denied with the comment: “Proposal 25-01-869 has been allocated”.

2 days is a short time, specially if problems happens during the setting up of experimental devices. Moreover, the starting time was at 16:00, which implied to start the measurements of the samples after midnight.

We obtained the XANES data of one of our solutions of Ag nanoparticles (labeled as “C5N4”) and the following standards: Ag metal, AgNO₃ powder, AgNO₃ in aqueous solution and Ag₂O powder. We also measured AgCl but due to its quickly degradation we were not able to achieve good data.

We did a linear combination fit of C5N4 with the measured standards and the Athena program [1]. Result is in Figure1.

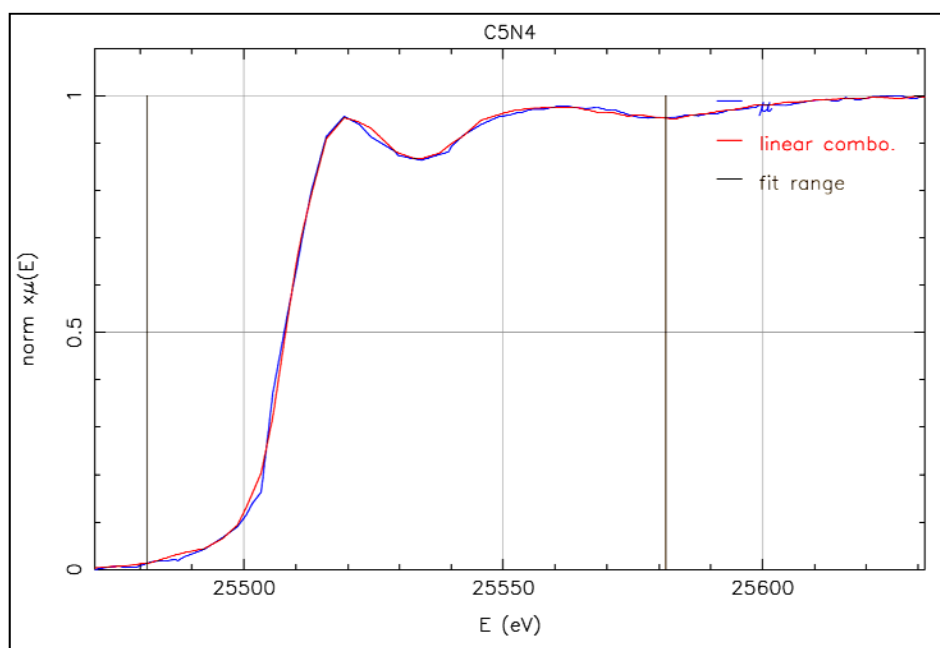


Figure 1. XANES spectrum of C5N4 Ag nanoparticles solution (blue) and the fitting (red) from linear combination of AgNO₃ (aqueous solution and powder).

The best linear combination fit that we obtained with the measured standards was 0.90 ± 0.05 aqueous AgNO₃ plus 0.10 ± 0.05 AgNO₃ powder, with R-factor = 0.000232, chi-square = 0.00682 and reduced chi-square = 0.0001515. Surprisingly, metal Ag was not in the fit.

Obviously, if we had measured more standards the result could have been better. From such result we interpret that almost all the Ag atoms have oxidation state I and the most are ions in aqueous solution.

This result proves we can measure the oxidation state of our nanoparticles. The next steps are to measure the rest of our Ag nanoparticles solutions and the healthy and cancer cells treated with such solutions. With such measurements we will know the percentage of Ag that reacts in the cells. Moreover, with carefully selected standards we could conjecture which atoms bond to Ag [2] and consequently we might speculate about the type of reaction.

In conclusion, considering the scarcity of time, the test was successful. Therefore, we would like to continue with the experiments in the future.

[1] B. Ravel and M. Newville, *J. Synchrotron Radiat.* **8**, 537 (2005).

[2] M.F. Lengke, B. Ravel, M.E. Fleet, G. Wanger, R.A. Gordon, G. Southam, *Environ. Sci. Technol.*, **40:20**, 6304 (2006).