

EXAFS ANALYSIS OF Fe<sup>2+</sup> WATER AND ACETONE BASED SOLUTIONW. Olszewski<sup>1\*</sup>, K. Szymański<sup>1</sup>, P. Zaleski<sup>1</sup>, and D. Zając<sup>2</sup><sup>1</sup> Faculty of Physics, University of Białystok, ul. Lipowa 41, 15-424 Białystok, Poland<sup>2</sup> Deutsches Elektronen-Synchrotron-HASYLAB, Notkestr. 85, 22607 Hamburg, Germany

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Most of the electrodeposition processes are performed in aqueous solutions. However, in case of chemically reactive metallic layers like Rare Earths, aluminium or alkaline metals, the use of nonaqueous electrolytes is necessary.

We have found a method of electroplating shiny 3d metallic layers (Fe, Co, Ni, Cu and Zn) from new type of electrolyte, which consists mainly of acetone [1]. Small concentration of cations (of the order of 10<sup>-2</sup> Mol/dm<sup>3</sup>) and the same current conditions of deposition for each element make this deposition method promising for applications.

Because of very small content of water, the electrolyte cannot be classified either as aqueous or as non-aqueous. We investigate the aqueous and nonaqueous electrolytes by Extended X-ray Absorption Fine Structure (EXAFS) to see the possible differences in local structure of the cations.

The initial measurements were performed at DORIS ring at HASYLAB, DESY. Typical results are shown in Fig. 1.

Experiments indicate that the shape of absorption curve of water solution weakly depends on the cation concentration. Obtained absorption curves are similar to the published measurement results for aqueous

concentrated solutions of cations [2, 3]. As can be seen in Fig. 1, the shape of acetone based solutions is different. We note that the differences are present at extended as well as at near absorption edge region. Our results indicate that local structure of 3d cations in aqueous and acetone solutions are remarkably different.

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## References

- [1] W. Olszewski, K. Szymański, M. Biernacka, R. Sobiecki, "3d-metallic layers electrochemically deposited from nearly nonaqueous electrolyte", *Mater. Sci.-Poland* (2007), in press.
- [2] M. Benfatto, P. D'Angelo, S. Della Longa, N.V. Pavel, "Evidence of distorted fivefold coordination of the Cu<sup>2+</sup> aqua ion from an x-ray-absorption spectroscopy quantitative analysis", *Phys. Rev. B* **65** (2002) 174205.
- [3] P. D'Angelo, M. Benfatto, S. Della Longa, N.V. Pavel, "Combined XANES and EXAFS analysis of Co<sup>2+</sup>, Ni<sup>2+</sup>, and Zn<sup>2+</sup> aqueous solution", *Phys. Rev. B* **66** (2002) 064209.

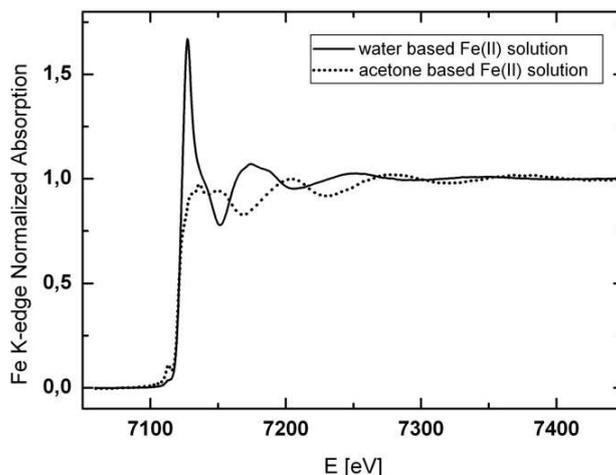


Figure 1. Fe K-edge normalized absorption of Fe<sup>2+</sup> electrolytes based on water and on acetone solutions.