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| | **Experiment title: $A_nBO_x$ materials for hydrogen production from water using sunlight excitation** | **Experiment number**: 25 01 607 |
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## Report:

Water decomposition in stoichiometric quantities of oxygen and hydrogen by working with photo-active solid systems was first reported by Fujishima and Honda [1] and recently some $A_nBO_x$-type oxides have been shown to be effective under sunlight excitation [2]. $A_nBO_x$-type oxides are typically constituted by a combination of d(0) and d(10) cations having energy levels in order to obtain valence/conduction band flat potentials adequate for the corresponding $H^+/H_2$ and $O_2/H_2O$ reactions, and a band gap energy allowing absorption in the visible region of the spectrum. However, such oxides have not been obtained in a nanostructured form as they are synthesized by solid state reaction at above 1473 K [2]. We have recently developed microemulsion and Pecchini based methods which are able to yield these oxide systems with a nanometric primary particle size and a high photochemical activity with respect to their bulk counterparts [3]. This XAS study was aimed to analyze the electronic (XANES) and structural (structural) properties of such nanostructured solids in comparison with their corresponding bulk counterparts synthesized by solid state methods.

The best catalytic performance for hydrogen production assisted by visible light has been obtained with solid $A_nBO_x$-type oxide systems having A = Ca, Sr, Bi, In and Ag and B = V, Ta, Nb, Cr, Mo, Bi and W [2,3]. Among them, during this run we focus our attention in the $BiMO_4$; $Bi_2MO_6$ (M = V, Cr, Nb, W) and $(Ca/Sr)MO_4$ (M = Cr, Bi, In), $AgMO_3$ (M = V, Cr) families of materials. Unfortunately, a limited control of monochromator motors only allowed to scan edges located between Cr K-egde and Bi L1-edge energies, stopping the study of $AgMO_3$ and Nb-, In-containing systems. Besides that, additional problems with the

cryostat did not allow to obtain EXAFS with adequate signal to noise ratio. By the end of the run most of the experimental problems were solved (or being in the way to be solved) but precluded the obtention of realiable XAS data, which hoepfully would be obtained in next beam times (vide supra).

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[1] A. Fujishima, K. Honda, Nature 238 (1972) 37.

[2] Z. Zea, H. Arakawa, J. Photochem. Photobiol. A 158 (2003) 145; Z.G. Zhou, J.H. Ye, K. Sayama, H. Arakawa, Nature 414 (2001) 625.

[3] C. Belver, M. Fernández-García, submitted.