Observation of electronic metal support interaction: investigation of Au/Ceria catalysts by HERFD-XANES

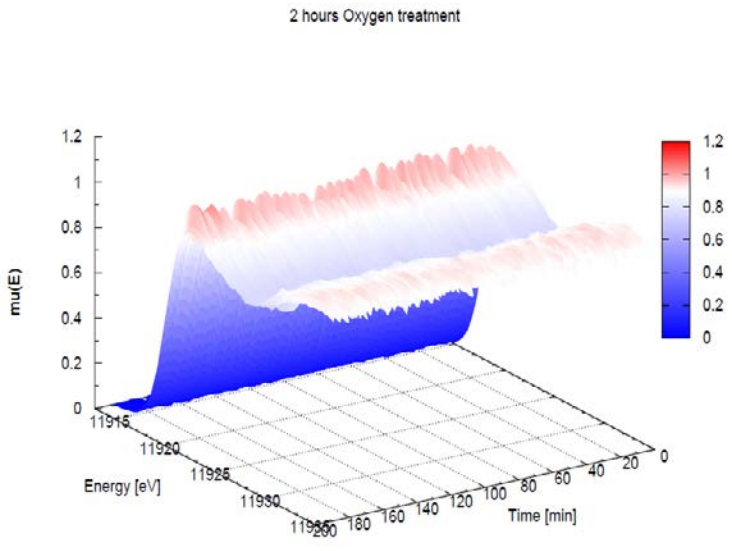
A. Longo[1,2], M.Rovezzi[3], M.P. Casaletto[2], P. Glatzel[4], A. Martorana[5] and L. Vince[1]

[1]XMI, Department of Chemistry, Ghent University, Krijgslaan 281 S12, Ghent, East Flanders 9000, Belgium, [2]Istituto per lo Studio dei Materiali Nanostrutturati (ISMN)-CNR, UOS Palermo, Via Ugo La Malfa 153, 90146 Palermo, Italy, [3]Univ. Grenoble Alpes, CNRS, IRD, Irstea, Météo France, OSUG, FAME, 38000 Grenoble, France, [4]European Synchrotron Radiation Facility, 71 Avenue des Martyrs, CS 40220, 38043 Grenoble, France, [5]Dipartimento di Fisica e Chimica, Università di Palermo, Viale delle Scienze Ed. 17, 90128 Palermo, Italy, **alessandro.longo@esrf.fr**

CO oxidation on a supported gold nanocatalyst has been a paradigmatic and pivotal problem in catalysis in the last two decades[1]. The scientific debate is focused on the relevance of particle size, valence state of gold and interaction with the support, however, despite the huge amount of experimental data and model simulations reported in the literature, an ultimate analysis of the key-factors determining the impressive low-temperature activity of nanosized gold towards CO oxidation is still lacking. Actually, these factors are difficult to isolate because they are closely intertwined.[1] However, the beneficial effect of the metal support interaction remains one of more accredited phenomenon able to explain the high catalytic performance of gold based metal catalysts. To address this crucial issue, a detailed investigation, by both experimental and computational approach, of the metal-support interface was undertaken.

According to theoretical prediction, the most important information arises from the interface Au atoms, which determine band modification both for the metal cluster and the support.

In this paper we report the results of a recent in situ HERFD-XANES at RT experiment carried out at the ID26 beam line of ESRF. It is evidence that a cyclic modification occurs and this is reversible during the redox treatments. Interestingly, Au cluster mediates the oxygen uptake in the ceria support (see fig below).



A. Longo, L.F. Liotta, G. Pantaleo, F. Giannici, A.M. Venezia, A. Martorana, J. Phys. Chem. C 2012, 116, 2960-2966.