PROGRAMMA SHORT TERM MOBILITY – ANNO 2015

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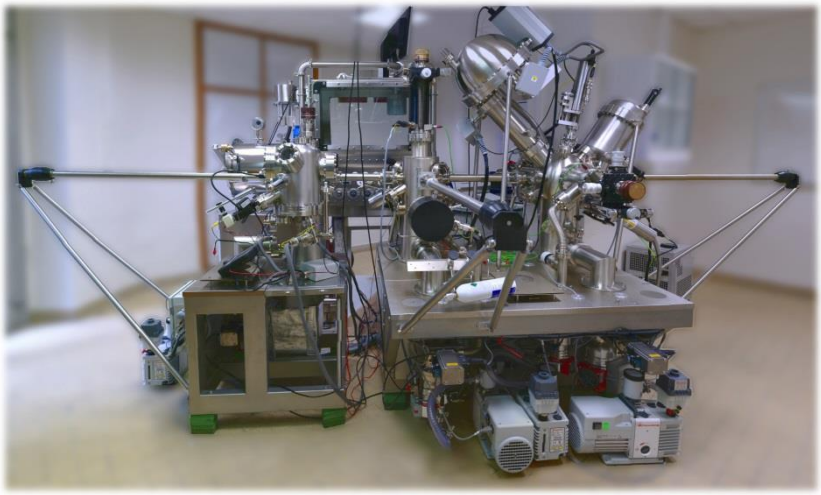
Titolo del programma: Tuning self-organised copper nanostructuration by oxynitridation.

Final Report:

1) Brief description of the experimental set-up



The experimental setup has been conceived to allow the study of solid/gas interfaces as well as solid/liquid interfaces. As seen in the figure below, the apparatus consists of a Scanning Tunnelling Microscopy (STM), an Atomic Force Microscopy (AFM) complemented by a Hemispherical Analyser for x-ray electron spectroscopy (XPS). The preparation chamber hosts an ion gun, an oven for high temperature annealing and all the tools necessary for the sample preparation (evaporators and leak valves for gas dosing). Moreover, the above mentioned UHV spectroscopic and microscopic facilities are coupled with a glovebox for the study of the reactivity in liquid in inert atmosphere. Measurements by XPS and STM can be carried out during gas dosing *in situ* at variable temperature. Electrochemical sample preparation and STM measurements *in situ* can also be performed owing to the sample transfer system without contact with air.

2) Brief description of the activity during the STM program:

In the figure below, the first test measurements with this novel apparatus have been done. The data refer to the O1s core level measurement taken on CuAl(111) during the oxidation at about 10^{-5} mbar of molecular oxygen as a function of the sample temperature. As can be seen from the figure in the middle a clear phase transition occurs in the temperature range from 300°C to 360°C: while a simple adsorption of the oxygen occurs below 300°C above, the reaction between Al and oxygen takes place leading to the formation of a stable layer of Al_2O_3 (the Cu- and Al-related core levels are not shown). The visit is to be considered as the first step of a long term collaboration, aiming at the study of the effects of the oxidation and nitridation of metals.