# The interaction between pure water and noble metals studied by means of the impedance spectroscopy and the photoelectric effect.

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In this talk some unexpected behaviors of water close to the metallic surfaces are reported. Starting from the evidence, obtained by Pollack's group, of the existence of a solute-exclusion zones (Ez) in metals, we have examined some physical properties of this zone and its influence on some characteristic of the metal.
As it regards the first aspect the Impedance Spectroscopy (IS)has been used . This method enables investigation of dielectric relaxation processes in an extremely wide range of characteristic time 10-4 ~1012 s.. Although it does not possess the selectivity of other methods as nuclear magnetic resonance or electron paramagnetic resonance, it offers important and sometimes unique information of the dynamic and structural properties of substances.
We have measured the polarizability of the Ez, close both to Nafion surfaces and to the surface of a noble metal (Pt). The dielectric constant of Nafion changes in a noticeable way, during the building up of the Ez, both in presence and in absence of the charged microspheres, used to detect the Ez. As it regards the Pt surfaces, the dielectric constant changes in a noticeable way when the a voltage is applied and, in presence of the microspheres, an Ez appears. There is a threshold for this phenomenon: if the applied voltage is not big enough, the Ez don't appears and the dielectric constant don't changes. It is worth to note that this change is noticeable and statistically significant in the lower frequency range.
As it regards the second aspect, because the Ez studied by Pollack's group appear to be sensitive to light, we have explored the possibility that the water-metal interface could influence the interaction between light and metal surfaces. The behavior of the water–metal interface is not fully understood even if it has recently been highlighted, due to its importance in fuel cells for hydrogen production, storage, and conversion. Even if several studies have been performed a rather large number of questions remain unanswered, as the reasons for the different behaviors of metals in water, and why some of them, such as platinum, are excellent electrodes, while others are not. So we have measured the effect of illumination on the potential, respect to a reference electrode, of some metals immersed in water. Our results show an action of liquid water on the work function of some metals much larger than assumed so far from theoretical calculations or measured on the metal-ice interfaces. This lead us to suppose that the substantial changes in work function measured are due to a complex structure of water in the vicinity of the metal surface.