Hydrogen Storage in Thin Metallic Films

Loránd Románszki, Nicola Naujoks, Michael Zäch and Bengt Kasemo
Chalmers University of Technology, Fysikgränd 3, F5112, 41296 Göteborg, Sweden
Lorand@chalmers.se

Hydrogen is a high energy density, environmentally ideal energy carrier in electric cars, a promising alternative of the conventional fossil fuels gradually being exhausted. For such applications, the problem of the hydrogen storage must be solved. High pressure hydrogen gas tanks onboard are not the best option and liquid hydrogen has its own disadvantages too. It has been known for long time, that certain metals can reversibly absorb hydrogen, however, none of these is perfect [1]. Palladium is an excellent hydrogen absorber metal, the kinetics being fast in both absorption and desorption way at room temperature, however, the storage capacity is less than 0.6 wt% and the metal is expensive. In contrast, magnesium is relatively cheap, with more than 7.6 wt% storage capacity, but the reversibility is poor and the decomposition temperature is too high (330 °C) for the polymer electrolyte membrane of the fuel cell. Therefore a lot of effort has been put in the research for the right metal, alloy or catalyst [2, 3].

Our contribution to this field consists in the study of hydrogenation/dehydrogenation processes in (nanostructured) thin metallic films with the quartz crystal microbalance technique. The experimental setup and some recent results will be presented.

References:

[1] Schlapbach L, Züttel A, Nature, **414** (2001) 353.
[2] Grochala W, Edwards PP, Chem. Rev., **104** (2004) 1283.
[3] Orimo S, Nakamori Y, Eliseo JR, Züttel A, Jensen CM, Chem. Rev., **107** (2007) 4111.