Hydrogenography sheds new light on the diffusion of hydrogen in metals

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In the search of a truly high-temperature superconductor we tried to metalize yttrium doped hydrogen under high pressure. Shining light during hydrogenation of an yttrium film in a diamond anvil cell led to our discovery of switchable mirrors [1]. Since then the transition from shiny metal to transparent semiconductor has been observed in many hydrides [2] and even in metals that remain metallic during hydrogenation. This opened the way to Hydrogenography [3], a new high-throughput optical technique to measure optically and simultaneously on thousands of (nano)structured samples, pressure-composition isotherms, enthalpies and entropies of hydride formation. For this conference, I shall show that Hydrogenography provides also unique possibilities to visualize hydrogen diffusion [4] and electromigration [5] in metals, study the refraction and reflection of diffusion fronts [6], determine the intrinsic hydrogen permeability in ternary alloys [7] and to unravel the intimate processes involved when H diffusion is accompanied by massive dilation in submicron patches of thin films [8]. Furthermore, I shall show that H diffusion in and out of nanoparticles can be measured by means of plasmon resonance [9].

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