

## MEASUREMENTS OF HYDROGEN ISOTOPES PERMEATION IN 316L STAINLESS STEEL AT LOW TEMPERATURE

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Key Words: hydrogen isotopes, permeation, diffusion, 316L, stainless steel

Usually, hydrogen isotopes permeation in 316L stainless steel is measured at relatively high temperatures, i.e. in the range [200 – 500 °C]. Moreover, results on diffusion and permeability coefficients can vary by one order of magnitude (see for instance [1] or [2]). Therefore, extrapolation of these coefficients measured at high temperatures to room temperature conditions can induce great uncertainties. Nevertheless, precise knowledge of hydrogen isotopes permeation is of high importance since high-pressure hydrogen storage is generally performed close to room temperature in 316L stainless steel reservoirs.

In this work, we have used deuterium to increase sensitivity and measure permeation in 316L stainless steel in the range [90 – 250 °C], thanks to a gaseous permeation cell [3]. Even for “thin” samples (400 to 500  $\mu\text{m}$ ), experiments can last more than 2 months, but signal remains usable. Results are compared to data extrapolated from high temperature measurements. Globally, low temperatures measurements are in agreement with extrapolations, not showing any evidence of hydrogen isotopes trapping.

[1] “Technical reference for hydrogen compatibility of materials”, C. San Marchi, B. P. Somerday, SANDIA REPORT, SAND2012-7321

[2] “Influence de l’hydrogène sur le comportement des métaux”, P. Tison, PhD Thesis, Pierre & Marie Curie university (Paris 6), 1983

[3] “Etude du comportement sous hydrogène d’une soudure homogène en acier inoxydable martensitique (APX4)”, F. Cusenza, PhD Thesis, Burgundy university, 2016