

Impact of hydrogen embrittlement on cryogenic mechanical properties of 304 steel

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Within the framework of the “AppLHy!” pilot project, the Karlsruhe Institute of Technology (KIT) is investigating the transport and application of liquid hydrogen (LH2). Due to the advantages of LH2, such as high energy density, high purity, storage at low pressure and the possible facilitation of the available cryogenic temperature level, various application scenarios are being investigated.

In this work, the influence of the hydrogen embrittlement on mechanical properties of the austenitic steel 304 from room temperature down to 20 K is investigated. The hydrogen content of the material is varied using a high pressure (max. 200 bar), high temperature (max. 300°C) hydrogen charging chamber. Tensile and fracture measurements are performed at different temperatures to evaluate the influence of the hydrogen content on the mechanical behavior. The results are reflected with regard to the microstructure and possible deformation mechanisms.

Submitters Country

Germany

Author: WEISS, Klaus-Peter (KIT, Institute for Technical Physics)

Co-authors: Prof. PUNDT, Astrid (Karlsruhe Institute of Technology); SCHULZ, Camelia (KIT, Institute for Technical Physics); Ms GAISINA, Elvina (Karlsruhe Institute of Technology); Mr ALHUSIEN ALI MAAROUF, Monzer (Karlsruhe Institute of Technology); ABBASI, Zahra (Karlsruhe Institute of Technology, Institute for Technical Physics)

Presenter: WEISS, Klaus-Peter (KIT, Institute for Technical Physics)

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