

## OP 171

### Study on Impact Toughness of the Austenitic Stainless Steels at Super-Cryogenic Temperature for Liquefied Hydrogen Storage Tanks

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The liquefied hydrogen has been recognized as an energy source that can simultaneously solve the energy and environmental problems. And the volume of liquefied hydrogen is about 1/800 compared to its gaseous state, making it advantageous for large-scale storage and transportation. However, research on the mechanical properties and hydrogen embrittlement of materials for liquefied hydrogen is still insufficient. In this study, the effects of temperature and hydrogen penetration on the impact toughness of 304L and 316L austenitic stainless steels and welds were investigated. Additionally, an evaluation of the pre-strained specimens considering the deformation during the tank manufacturing process was also performed. Mechanical properties were evaluated through Charpy impact toughness tests before and after hydrogen charging according to temperatures, including -253 degrees. Furthermore, the correlation between hydrogen contents and phase fractions (Ferrite, Strain-Induced Martensite), and mechanical properties was analyzed. As a result, impact toughness values of austenitic stainless steels satisfied above 27J in a cryogenic hydrogen environment and showed excellent hydrogen embrittlement resistance. On the contrary, the toughness was degraded by the presence of ferrite and martensite.