I Aviles Santillana et al., J Material Sci Eng 2016, 5:7 (Suppl)
http://dx.doi.org/10.4172/2169-0022.C1.046

Fracture toughness of austenitic stainless steel welds for ultra-high vacuum and cryogenic applications

I Aviles Santillana[1, 3], **M Amez – Droz**[2], **F de Mestral**[2], **E M Ruiz Navas**[3] and **S Sgobba**[1]
[1]CERN, Switzerland
[2]High School of Landscape, Engineering And Architectural, Switzerland
[3]University Carlos III of Madrid, Spain

Austenitic stainless steels have been used extensively for very low temperature applications due to their high strength and ductility, ready weldability, high fracture toughness and a low fatigue crack growth rate down to cryogenic temperatures. Today stainless steels are also the dominant materials of ultra-high vacuum (UHV) constructions. For the most demanding applications, a high temperature vacuum firing treatment is applied to the finished components in order to reduce the outgassing rate. Vacuum firing, for some specific applications, might be carried out within the range of sensitization temperatures for the steel. For this reason, it is essential to assess the impact of such heat treatments on the ductility and fracture mechanics properties of stainless steels, which are particularly relevant for components to be used in the cryogenic temperature range. The present paper investigate mechanical and fracture toughness behavior at 4 K of AISI 316L and AISI 316LN tungsten inert gas (TIG) welds using austenitic stainless steel filler (EN 1.4453). Additionally, the effect on fracture toughness of two typical vacuum firing treatments (950ºC for 2 hours and 650ºC for 24 hours) is evaluated. A correlation between the evolution of properties and microstructure as resulting from the above treatment is provided.

Biography

I Aviles Santillana has completed his Master studies in Industrial Engineering with intensification in Science and Engineering of Materials from the Universidad Carlos III of Madrid. His Master's thesis on electron beam welding of dissimilar materials granted him the opportunity to join Dr. Sgobba´s materials section at CERN, where he spent 3 years doing materials studies for particle accelerators. After that, he started his PhD under Sgobba´s supervision in the field of mechanical behavior of austenitic stainless steels at cryogenic temperatures.

Ignacio.Aviles.Santillana@cern.ch

Notes: