

Toughness of duplex steel produced by PM-HIP

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Components produced by PM-HIP from corrosion resistant steels with a ferritic-austenitic duplex microstructure are widely used in offshore-applications and in the chemical industry. In most of these applications high toughness –particular at low temperatures –is a mandatory requirement. In contrast to austenitic steels, toughness of duplex steel shows a temperature dependent transition from ductile to brittle behaviour. While PM-HIP duplex steels mostly have superior strength and corrosion resistance compared to conventionally produced grades, the toughness issue often leads to discussions.

In this contribution the most important influencing factors for the toughness of duplex steels will be discussed exemplarily at grade AISI 2205. Focus will be given to two major aspects: the embrittlement by δ -phase and the embrittlement caused by residual argon pores. While the formation of δ -phase depends on the cooling rate in the HIP vessel, argon porosity can either be caused by insufficient evaporation prior to HIP or small leakages in the capsule. Toughness will be discussed in terms of Charpy tests, taking into account the notch radius as additional parameter. The macroscopic results will be reflected by investigations of the microstructure. Toughness of PM-HIP steel will be compared to appropriate conventionally produced grades.

Please choose topic

Materials

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