

Influence of rapid cooling rates for hot isostatic pressing on mechanical and corrosion properties of UNS S32205

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The formation of undesirable intermetallic phases affected by low cooling rates of HIP-manufactured components made of duplex stainless steels requires a conventional heat treatment combined with quenching in a water bath. From a technical point of view, this thermal post-treatment is energy-intensive as well as time-intensive. An approach to avoid these disadvantages is the application of an internal cooling system in the HIP facility to achieve high cooling rates. The influence on the metallurgical structure, the mechanical properties and the corrosion resistance is discussed for a 2205 duplex stainless steel. For this purpose, conventional heat treated components are compared with fast cooled components with the same material.

Metallographic investigations show a clear influence of the cooling rate and wall thickness on grain size, austenite/ferrite ratio as well as the number and the expression of intermetallic phases. The mechanical properties are determined according to notch impact test ISO 148-1 and tensile test ISO 6892-1. The corrosion resistance was measured according ASTM G150-13. Technical opportunities and economic aspects for the production of thick-walled components are discussed.

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HIP Process

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