

HIGH-TEMPERATURE X-RAY DIFFRACTION OF ASTM A743 GRADE CA6NM CAST MARTENSITIC STAINLESS STEEL

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High-temperature X-Ray Diffraction is a very helpful technique for studying structural phase transformations because of its ability to clearly identify the phases at temperatures below and above particular transitions, even in the cases when no significant changes in physical properties are evident.

In this work, high temperature X-Ray Diffraction was used to analyze thermal expansion during heating and identify phase transformation temperatures, as well as to study the isothermal phase evolution at several temperatures in the range between 150°C and 1000°C in an ASTM A743 grade CA6NM martensitic stainless steel, which is widely used for manufacturing hydraulic components such as turbines, impellers and liners. Special focus was put on the determination of the amount of retained austenite in the microstructure.

A methodology to precisely identify and quantify phases in ASTM A743 grade CA6NM martensitic stainless steel at different temperatures in the range between 680 and 860°C was developed. The results were validated with previous dilatometric data and the drawbacks of the method were discussed in detail.