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STUDY ON BRAZING RESIDUAL STRESS OF STAINLESS STEEL WITH ALUMINA BY FINITE ELEMENT METHOD

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ABSTRACT Ceramic is an interesting potential candidate to replace stainless steel to be used in the high temperature heat exchangers due to its high temperature resistance, high hardness and erosive resistance. However, the ceramic is quite difficult to manufacture and braze because of the inherent hard and brittle properties. Hence, the connection between ceramic and stainless steel has become one of the biggest challenges for the application of ceramic. In this paper, the bonding technique of vacuum brazing is used to combine the SS304 stainless steel and alumina-based ceramic. The residual stress has been analysed by ANSYS software. It is found that the maximum residual stress occurs at the welding joint, which is uneven distributed along the welding line. The residual stress is mainly affected by the thickness of filler. Based on the research of different interface structure models, the result demonstrates that it is necessary to select the optimal interface structure to achieve the best brazing joints, which has lower residual stress. The result shows that the longitudinal residual strength and shear residual stress can be reduced by sinusoidal contact surfaces. Brazing with different physical connections can improve the intensity obviously.

Keywords: residual stress, high temperature heat exchanger, brazing joints