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Residual stress analysis with visualization thermal deformation using Electronic Speckle Pattern Interferometry JUN SHITAKA, SANICHIRO YOSHIDA, Southeastern Louisiana Univ, TOMOHIRO SASAKI, Niigata Univ — A nondestructive method to analyze brazing-induced residual stress is proposed. This method applies thermal loads to the specimen and visualizes the resultant deformation using optical interferometry known as Electronic Speckle-Pattern Interferometry (ESPI). Using the temperature dependence of the thermal expansion and elastic modulus known for the material, we estimate the residual stresses from the visualized deformation. As a temperature rise, the coefficient of thermal expansion increases and elastic modulus decreases. On the other hand, compressive/tensile residual stress increases/decreases elastic modulus as the inter-atomic distance decreases/increases. This is because the inter-atomic potential energy curve is steeper on the short interatomic distance side of the equilibrium. In this study, we used a dissimilar joint tool steel SKD11 and cemented carbide V30, as a sample specimen. We plan to compare the estimated residual stress with an analysis based on X-ray diffractometry. Our final goal is to develop a totally nondestructive method based on the thermal loading and ESPI deformation analysis. We will report our preliminary results of the research.

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