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Analysis of residual stress in welds using electronic speckle-pattern interferometry (ESPI) SEAN CRAFT, BISHWAS GHIMIRE, BIDHAN THAPA, T. SASAKI, SANICHIRO YOSHIDA, None — Residual stress is stress which is locked-in inside of a material and is independent of external load/force. The material under consideration is a welded metal sample consisting of two different constituent metals. In this case, the cause of the residual stress is the fact that the two metals, when cooled down from the high temperatures of the welding process, will contract at different rates and to differing degrees due to a difference in their respective coefficients of linear expansion. Of course, because they are now attached, the metals will try to deform one another, which creates internal forces at the weld site. The technique we will be using to analyze this residual stress is electronic speckle-pattern interferometry (ESPI). In unrelated experiments, ESPI has been successfully utilized to show areas of concentrated stress when external forces are applied to a sample metal. Our conjecture is that it can also be used to analyze the areas where residual stress is located within a sample such as that described above. Our method of analysis is based on the following hypothesis: if a slight tensile force is applied to the welded sample perpendicular to the weld, this will cause the sample to contract parallel to the weld. Near the weld site, on one side of the weld, the sample will resist this deformation, due to the fact that it is already deformed in this direction by the residual stress. And conversely, on the other side of the weld, the sample should welcome this deformation.

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None

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