



Contribution ID: 35

Type: **Poster**

Residual stresses in Cu matrix composite surface deposits manufactured via laser melt injection

Friday, December 9, 2022 3:30 PM (1h 30m)

Metal matrix composite (MMC) coatings can improve surface wear resistance significantly. However, both macro and micro residual stresses exist in the MMC coatings, causing detrimental effects such as reducing service life. Based on neutron diffraction, we determined the residual stresses in the spherical fused tungsten carbide (sFTC) reinforced Cu matrix composite surface deposits after laser melt injection. A thermo-mechanical coupled finite element model was also developed to predict the residual stresses. We found that the residual stresses are low in the sFTC/Cu composite deposit produced with 400 °C preheating temperature, with a maximum tensile residual stress of about 100 MPa in the Cu matrix on the top surface. In contrast, the residual stresses in the sFTC/bronze (CuAl10Ni5Fe4) composite deposit are very high. The maximum tensile residual stress in the Cu matrix of the sFTC/bronze composite deposit reaches about 650 MPa on the top surface. The present investigations can help to control the residual stresses in the Cu matrix composite surface deposits and thus increase the service life of wear-resistant coatings in the future.

Primary author: ZHANG, Xingxing

Co-authors: Ms LANGEBECK, Anika (BIAS –Bremer Institut fuer angewandte Strahltechnik GmbH); Mr FRITZEN, Felix (University of Stuttgart); Mr BUNN, Jeffrey R. (Oak Ridge National Laboratory); Ms REBELO-KORNMEIER, Joana (Technical University of Munich); Mr HOFMANN, Michael (Technical University of Munich); Mr PEREIRA ALESSIO, Renan (University of Stuttgart); Ms CABEZA, Sandra (Institut Laue-Langevin); Mr ALAMEDDIN, Shadi (University of Stuttgart)

Presenter: ZHANG, Xingxing

Session Classification: Poster Session

Track Classification: Material Science