Contribution ID: **18** Type: **Poster**

Residual stresses in bronze matrix composite surface deposits after laser melting injection

Tuesday, 5 December 2023 14:00 (3 hours)

Wear causes a loss of 2% to 7% of the gross national product in industrialized countries. Therefore, developing wear-resistant coatings and optimizing their manufacturing processes are essential. A novel metal matrix composite (MMC) coating has been developed via laser melting injection (LMI) technique over the last few years, which consists of a bronze matrix and tungsten fused carbides. Tribological tests have shown that this MMC coating has the potential to reduce wear by ~80%.
However, macro and micro residual stresses exist in the MMC coatings, which significantly affect the performance of the MMC coatings, such as causing dimensional distortion, reducing the fatigue strength and service life. Therefore, it is critical to characterize the residual stresses in the MMC coatings.
In this research, the residual stresses in the LMI bronze matrix composite surface deposits were measured via neutron diffraction experiments. The residual stresses along the depth direction from the surface of the deposit to the center of the sample were determined nondestructively due to the large penetration depth of neutrons. Based on this result, a thermo-mechanical finite element model was developed to describe the measured stress distribution. The combined experiment and simulation study provides detailed insight into the residual stress state in the LMI MMC coatings and is helpful in optimizing the laser processing and tailoring the residual stress.

Primary author: Prof. ZHANG, Xingxing (Institute of High Energy Physics)

Co-authors: WALZ, Erik (FRM II / STRESS-SPEC); Dr REBELO KORNMEIER, Joana; Dr LUZIN, Vladimir (ANSTO); HOFMANN, Michael

Presenter: HOFMANN, Michael

Session Classification: Poster Session

Track Classification: Material Science