## MLZ User Meeting 2019



Contribution ID: 7

Type: Talk

## Residual stress and FEM modeling in metal matrix composites

Tuesday, 10 December 2019 13:57 (15 minutes)

Residual stresses (RSes) in metal matrix composites (MMCs) are more complicated than in homogeneous materials. They can be divided into macro and micro (elastic mismatch, thermal misfit and plastic misfit) RSes. Therefore, precise characterization of RSes in MMCs is difficult. Previous method for diffraction-based RS analysis in MMCs has several drawbacks [1-3].

In the past few years, a new and reliable method is developed by the authors for diffraction-based RS analysis in MMCs [4]. By using this method, the macro and micro RSes in friction stir welded SiC/Al composites were determined [4]. The effects of welding parameters and post weld heat treatment were assessed. Furthermore, a multiscale finite element model is developed to predict the RSes [5-7].

Reference

[1] Fitzpatrick ME, Hutchings MT, Withers PJ. Acta Mater. 1997;45:4867.

[2] Eshelby JD. Proc R Soc Lon Ser-A 1957;241:376.

[3] Mercier S, Jacques N, Molinari A. Int. J. Solids Struct. 2005;42:1923.

[4] Zhang XX, Ni DR, Xiao BL, Andrae H, Gan WM, Hofmann M, Ma ZY. Acta Mater. 2015;87:161.

[5] Zhang XX, Xiao BL, Andra H, Ma ZY. Compos. Struct. 2016;137:18.

[6] Zhang XX, Wang D, Xiao BL, Andrae H, Gan WM, Hofmann M, Ma ZY. Mater. Des. 2017;115:364.

[7] Zhang XX, Wu LH, Andrä H, Gan WM, Hofmann M, Wang D, Ni DR, Xiao BL, Ma ZY. J. Mater. Sci. Technol. 2019;35:824.

Primary author: Dr ZHANG, Xingxing (Institute of Metal Research, Chinese Academy of Sciences)

**Co-authors:** Dr GAN, Weimin (Helmholtz-Zentrum Geesthacht); HOFMANN, Michael; Dr ANDRÄ, Heiko (Fraunhofer Institute for Industrial Mathematics); Prof. MA, Zongyi (Institute of Metal Research, Chinese Academy of Sciences)

Presenter: Dr ZHANG, Xingxing (Institute of Metal Research, Chinese Academy of Sciences)

Session Classification: Materials Science

Track Classification: Materials Science