Contribution ID: **163**

Type: **Talk (17 + 3 min)**

Polarization contrast neutron imaging of magnetic phases in additively manufacturing specimens

Wednesday 22 March 2023 11:50 (20 minutes)

Martensitic phase transitions are of utmost importance for structural and smart materials such as for example steels and shape memory alloys, respectively. Apart from destructive, local or integral methods neutron imaging techniques have been explored to spatially map and quantify martensitic phase fractions in such materials. Such techniques include neutron Bragg edge and neutron dark field imaging. However, the latter methods require long exposures to achieve suitable signal to noise ratio and can suffer from significant bias e.g. in strongly textured materials. The depolarization of a polarized incident white neutron beam when interacting with the field of magnetic domains in a ferromagnetic material is a well-known effect. In this work, we show how polarization contrast neutron imaging can be used to map and quantify ferromagnetic phases in additively manufactured samples of iron-based alloys and Fe-Mn-Si shape memory alloys. The method provides spatial resolutions significantly beyond these of conventional neutron diffraction and is exceptionally sensitive to low ferritic phase fractions. Furthermore, the method requires exposure times of only a few tens of seconds to a few minutes, making it efficient in particular for time-resolved studies, e.g. to follow the evolution of the crystalline phase transformations in response to external loads, but also for tomographic measurements with many angular projections for correspondingly high spatial resolution.

Author: BUSI, Matteo

Co-authors: Dr POLATIDIS, Efthymios (Paul Scherrer Institut); Ms FERRETTO, Irene (EMPA); Dr LEINENBACH, Christian (EMPA); STROBL, Markus (PSI)

Presenter: BUSI, Matteo

Session Classification: Engineering 2

Track Classification: Engineering applications