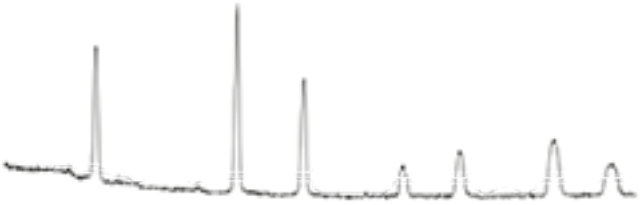

Contribution ID: **41** Type: **Poster**

Studying the temperature-dependent lattice misfit of γ′ strengthened superalloys with a varying Co/Ni-ratio using neutron and high-resolution X-ray diffraction

Wednesday, 1 June 2022 18:10 (20 minutes)

Superalloys strengthened by ordered γ′ precipitates are widely used in aircraft engines due to their excellent high-temperature properties and play, therefore, an essential role for mobility. The γ matrix phase and the coherently embedded γ′ precipitates have slightly different lattice parameters due to their different chemical compositions resulting in a constrained lattice misfit between both phases. In this study, the lattice misfit of the model alloy series Ni–Co–9Al–8W–8Cr (at.%) with a varying Co/Ni-ratio was investigated by neutron and X-ray diffraction. The room temperature lattice misfit of polycrystalline (PX) samples was investigated by means of neutron diffraction. Moreover, the lattice misfit of single crystalline (SX) samples as a function of the temperature was studied by employing high-resolution X-ray diffraction (HRXRD) up to 1000 °C. The Co/Ni-ratio strongly affects the sign of the lattice misfit and its temperature-dependent behavior. The Ni-rich alloys show a negative lattice misfit at room temperature that becomes more negative at higher temperatures. In contrast, the Co-rich alloys exhibit a positive lattice misfit at room temperature that slightly tends towards zero upon heating. Since the sign and magnitude of the lattice misfit at high temperatures strongly affect the resulting coherency stresses within the alloys and thus mechanical properties, knowledge of the temperature-dependent lattice misfit is crucial for future superalloy development.

Primary author: BANDORF, Jakob (Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU))

Co-authors: Dr ZENK, Christopher H. (Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU)); VOLZ, Nicklas (Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU)); Dr DOLOTKO, Oleksandr (Heinz Maier-Leibnitz Zentrum (MLZ), Technische Universität München); Dr NEUMEIER, Steffen (Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU))

Presenter: BANDORF, Jakob (Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU))

Session Classification: Posters

Track Classification: Main