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Time-resolved kinetics ordering of FeAl

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In this study, time resolved X-ray scattering using a synchrotron X-ray source has been used to gain insight of time-temperature atomic ordering of an intermetallic Fe₄₀Al ball-milled powder with the aim to extrapolate these results as an explanation of rapid ordering processes occurring during thermal spray coating deposition. Interestingly, present results show that in the range between 400 to 650°C, the evolution of the atomic order with time can be observed through the processing and fitting of the first acquired diffractograms, while above such temperatures, the ordering process is too fast to be able to be resolved with the available time resolution. Specifically, after performing Rietveld analysis of the data to fit the occupation factors of the Fe and Al atoms within the B2 lattice, it has been observed that at low temperatures such factor for the Fe changes slowly with the time and faster at higher temperatures as expected; the evolution seems to be non-exponential at moderate temperatures. The changes on the crystal lattice parameter upon heating and cooling, and its time dependence in the up-quench to moderate temperatures have been also investigated.

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