Novel High-Temperature Austenitic Alloys for Energy Conversion Applications

Ian Baker, Thayer School of Engineering
Dartmouth College, Hanover, NH

Solution-treated Fe-20Cr-30Ni-2Nb-5Al (at.%) provides a fully austenitic matrix supersaturated with Nb, which is useful for studying the precipitation of the Laves phase Fe$_2$Nb (see figure). Such Fe$_2$Nb precipitates could be used in the future to strengthen and extend the life of materials used in high temperature applications if they are present on a small enough scale.

A number of interesting observations were noted:

• When the alloy was subject to a 90% thickness reduction followed by aging at 800 °C, particles exhibited a finer dispersion than that obtained by simply aging at 800 °C.

• A promising combination that includes a thickness reduction of 90% and subsequent 700°C, 240 h aging treatment exhibited the finest Fe$_2$Nb precipitates.

The results from this study were promising and a more in-depth analysis of not only Fe$_2$Nb precipitation, but also NiAl precipitation is currently underway.