OAK RIDGE NATIONAL LABORATORY
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Cast Heat-Resistant Austenitic Stainless Steels with Improved High Temperature Creep Properties and Balanced Alloying Element Additions

Disclosure Number

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Technology Summary

This invention deals with the development of new cast heat-resistant austenitic alloys whose compositions were scientifically designed based on an understanding of the effect of alloying elements on the thermodynamic stabilities and compositions of various phases in the Fe-Cr-Ni alloy system. The key point in this invention is the addition of balanced quantities of alloying elements achieved through thermodynamic calculations. Thermodynamic calculations were used to calculate the stabilities and compositions of various phases as a function of alloying element content. Using such calculations, desirable phases such as austenite, M23C6, and MC have been retained in the microstructure to higher temperatures. Moreover, the new alloys contain an optimum combination of complex carbides with alloying element additions enhancing their stability. For example, W and Mo improve the stability of M23C6, while Mo, and Nb improvement stability of MC carbides. The new compositions when tested at 2200oF (1204oC) showed improved properties when compared with the very expensive cobalt containing alloy Supertherm.

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