

**THE INFLUENCE OF ZIRCONIUM CONTENT  
ON THE EUTECTIC TEMPERATURES OF HAFNIUM  
BEARING ALLOYS**

By

Heather McGee

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Approved:

Dan Lewis, Thesis Adviser

Rensselaer Polytechnic Institute  
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Hafnium and chromium are components in new refractory alloys currently under development. Most commercially available hafnium has a zirconium content of approximately 5.9 at.% (3 wt.%). The effect of this zirconium impurity on melting temperatures in the Cr-Hf and Cr-Hf-Si systems has not been conclusively determined. This investigation was conducted to determine if the zirconium present in the commercially available hafnium depresses the melting points of alloys in these systems.

Near eutectic alloys were prepared using hafnium containing 5.9% or 0.39 at.% zirconium. Microstructural and differential thermal analysis (DTA), were performed on these alloys to determine if there is a measurable difference in the eutectic temperatures due to the zirconium content.

The Cr-Hf and Cr-Hf-Si systems each contain a chromium-rich eutectic and a hafnium-rich eutectic. The melting temperatures of the chromium-rich eutectics in the Cr-Hf and Cr-Hf-Si systems were determined to be  $1662\pm 5^{\circ}\text{C}$  and  $1585\pm 5^{\circ}\text{C}$ , respectively. No measurable difference was found in the melting points of alloys prepared with the two grades of hafnium. However, there was a difference in the melting points of the hafnium-rich eutectics. In the Cr-Hf system the melting temperature of the hafnium-rich eutectic was determined to be  $1457\pm 5^{\circ}\text{C}$  for alloys prepared with hafnium that contained 5.9 at.% zirconium and  $1466\pm 5^{\circ}\text{C}$  for alloys prepared with hafnium that contained 0.39 at.% zirconium. The melting temperature of the hafnium-rich eutectic in the Cr-Hf-Si system was determined to be  $1417\pm 5^{\circ}\text{C}$  for alloys prepared with hafnium that contained 5.9 at.% zirconium and  $1432\pm 5^{\circ}\text{C}$  for alloys prepared with hafnium that contained 0.39 at.% zirconium.