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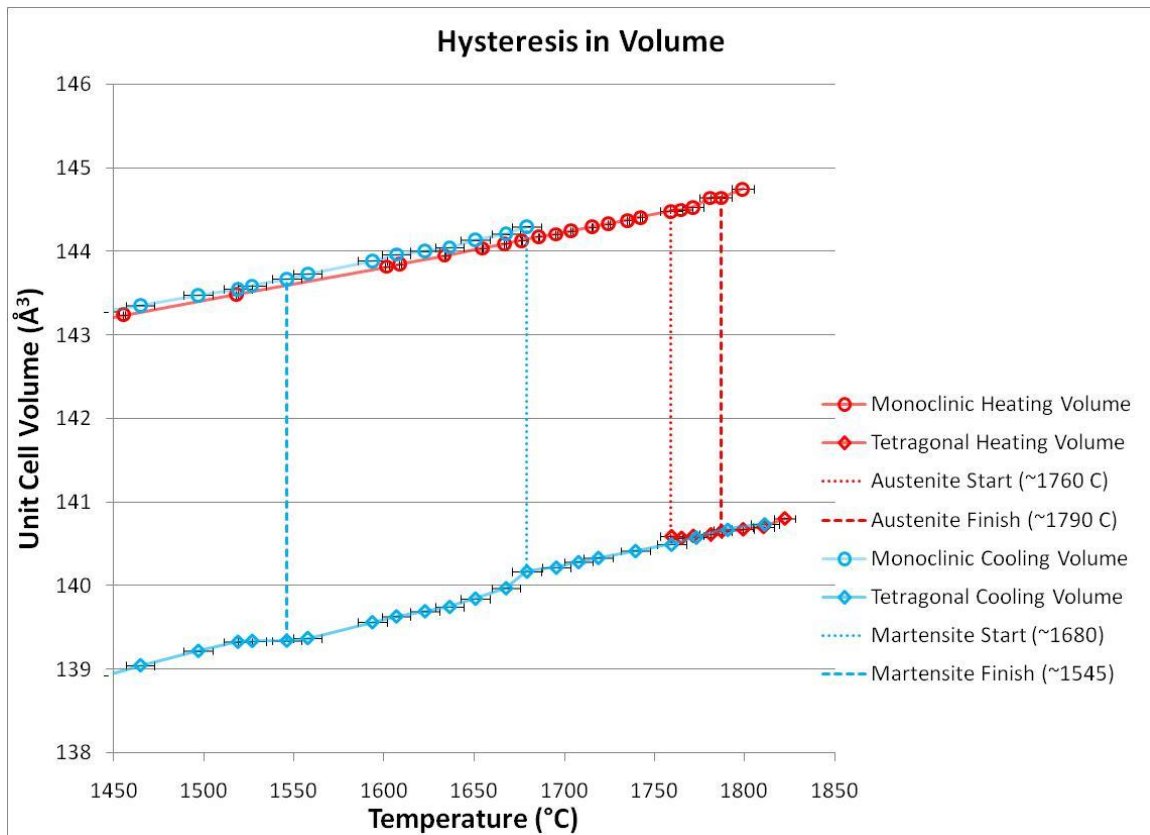
# IN SITU STUDY OF PHASE TRANSFORMATIONS AND PHASE EQUILIBRIA IN THE TANTALA AND HAFNIA BINARY SYSTEM

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## Abstract

Tantala ( $\text{Ta}_2\text{O}_5$ ) has useful dielectric, optical, catalytic and chemical properties while hafnia ( $\text{HfO}_2$ ) has found applications as a high temperature structural ceramic. Tantala and hafnia ceramics have yet to be studied in detailed. During this study, the  $\text{Ta}_2\text{O}_5$ - $\text{HfO}_2$  binary system was investigated using high temperature x-ray diffraction from room temperature to  $1650^\circ\text{C}$  in air using synchrotron radiation. The crystal structures of  $\text{Ta}_2\text{O}_5$ ,  $\text{HfO}_2$  and  $\text{Hf}_6\text{Ta}_2\text{O}_{17}$  were examined with their corresponding phase transformations and 3-D thermal expansions.



In situ synchrotron study of the monoclinic to tetragonal transformation on heating in hafnia ( $\text{HfO}_2$ ) showing a volume decrease on heating (red) as well as a volume increase and hysteresis on cooling (bleu).

$$\frac{\Delta V}{V_0} = -2.73 \pm 0.04\%$$

$$\frac{\Delta V}{V_0} = 2.99 \pm 0.06\%$$