HIGH-TEMPERATURE BEHAVIOR IN ENTROPY-STABILIZED OXIDE ($Mg_{0.2}Co_{0.2}Ni_{0.2}Cu_{0.2}Zn_{0.2}$)O

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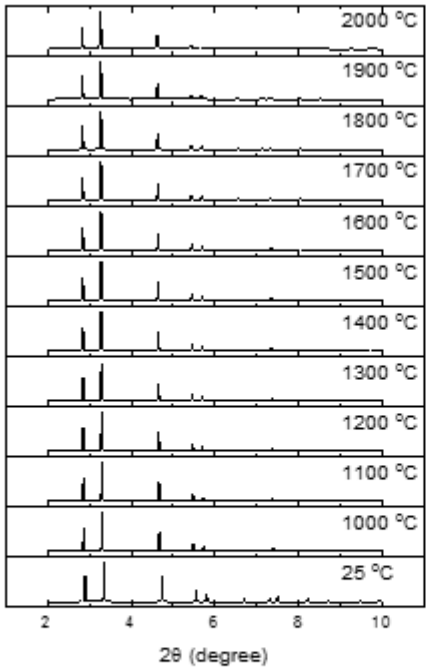
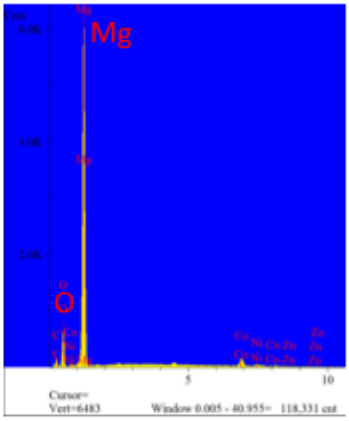
High entropy oxide (HEO) ($Mg_{0.2}Co_{0.2}Ni_{0.2}Cu_{0.2}Zn_{0.2}$)O has been synthesized by the polymeric steric entrapment method and characterized through high-temperature in-situ synchrotron experiments. HEOs are a new area in ceramics derived from high entropy alloys with disordered cations located in oxygen sites. The polymeric steric entrapment method has advantage over other methods because it can enhance homogeneity during synthesis. In HEO ($Mg_{0.2}Co_{0.2}Ni_{0.2}Cu_{0.2}Zn_{0.2}$)O, only a small amount of secondary copper oxide phase with tenorite structure can be found without quenching. At 2000 degrees Celsius under in-situ synchrotron experiments, material ($Mg_{0.2}Co_{0.2}Ni_{0.2}Cu_{0.2}Zn_{0.2}$)O was partially melted, which indicated that some of the oxides (e.g. cobalt oxide, nickel oxide) separated from the disordered oxide phase and melted at their individual oxide melting temperatures. The dominant material above 2000 degrees Celsius is magnesium oxide, the only oxide in ($Mg_{0.2}Co_{0.2}Ni_{0.2}Cu_{0.2}Zn_{0.2}$)O sample with a melting temperature higher than 2000 degrees Celsius. No secondary phase in ($Mg_{0.2}Co_{0.2}Ni_{0.2}Cu_{0.2}Zn_{0.2}$)O was found from synthesized temperature to melting.



No secondary phase can be found up to 2000 degrees Celsius. However, the sample was partially melted at high temperature.



Magnesium oxide is the dominated phase at 2000 degrees Celsius. Other cations in HEO ($Mg_{0.2}Co_{0.2}Ni_{0.2}Cu_{0.2}Zn_{0.2}$)O tend to go through phase separation and melt.