革新的材料プロセス研究センター主催　革新的材料特別セミナーのお知らせ

カリフォルニア大学アーバイン校の研究者 Alexander D. Dupuy 博士が高エントロピー酸化物における相変態についてレクチャーしていただけます。Dupuy 博士は UCRiverside で博士号を獲得されたあと、UCI でプロジェクトサイエンティストとして無機材料の研究をされております。

高エントロピー材料は高エントロピー合金に代表される５つ以上の元素が含まれている単相の固溶体のことであり、従来では確認されていない特異な物性を示します。材料にあまり詳しくない方でも理解できるように、基礎的な部分を丁寧に説明しながら、世界の最先端のトピックスを解説していただける内容の講演です。

11 月 18 日 11 時から ZOOM にて行う予定です。

https://us02web.zoom.us/j/86733077382?pwd=RXdlc05WanliOU4yTkFvL00xWTk5UT09

ミーティング ID: 867 3307 7382　パスコード: 7464

Title:　Phase Transformations in High Entropy Oxides

Abstract

High entropy oxides (HEOs) are ceramic materials consisting of five or more oxide components which form a single-phase solid-solution structure after processing. Despite their recent discovery, HEOs already show promise in a variety of applications, particularly in electronics and battery components. A unique characteristic of HEOs is their reversible phase transformation between the single-phase and multiphase states. The phase transformation manifests as the formation of secondary phases, whose volume fractions can be controlled through heat treatment. This feature presents an opportunity to produce oxide materials with highly controlled phase states, microstructures, and behavior.

Here, we explore the behavior and consequences of this phase transformation in (CoCuMgNiZn)O. First, we show that solid-state synthesis and sintering can be used to consolidate fully dense HEO ceramics with grain sizes spanning several orders of magnitude. After heat treatment, we observe that the phase transformation manifests as the formation of Cu-rich tenorite and Co-rich spinel secondary phases. We demonstrate that the phase heterogeneity can be controlled through heat treatment, while the as-consolidated grain size significantly influences the secondary phase evolution and morphology.

Relevant publications by the presenter:

[1] A.D. Dupuy, et al., Entropic phase transformation in nanocrystalline high entropy oxides, Mater. Res. Lett. 7 (2019) 60–67.

[2] A.D. Dupuy, et al., Multiscale phase homogeneity in bulk nanocrystalline high entropy oxides, J. Eur. Ceram. Soc. 41 (2021) 4850–4858.

[3] A.D. Dupuy, et al., Nucleation and growth behavior of multicomponent secondary phases in entropy-stabilized oxides, J. Mater. Res. (2022).