

# SYNTHESIS AND CRYSTALLOGRAPHY OF HIGH ENTROPY METAL CARBIDES: A NEW CLASS OF ULTRAHIGH TEMPERATURE AND IRRADIATION RESISTANT CERAMICS

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In this project, we have implemented a novel solvothermal synthesis process for the preparation of high entropy metal carbide (HEMC) powders. Specifically, mixtures of Mo-Nb-Ta-V-W carbides were produced by mixing metal chlorides and carbon powder in the presence of molten lithium. We have produced binary, ternary, quaternary, quinary, and senary metal carbides through systematic manipulation of elemental composition. Solid solutions, as illustrated in Figure 1, have been confirmed by a combination of X-ray diffraction (XRD) and energy dispersive spectroscopy (EDS). Rietveld refinement was used to deconvolute the XRD data and obtain approximate phase compositions of the different carbides. Subsequently, spark plasma sintering (SPS) was used to obtain dense specimens of compositionally complex ceramics. Irradiation of the sintered specimens was analyzed and will be discussed.

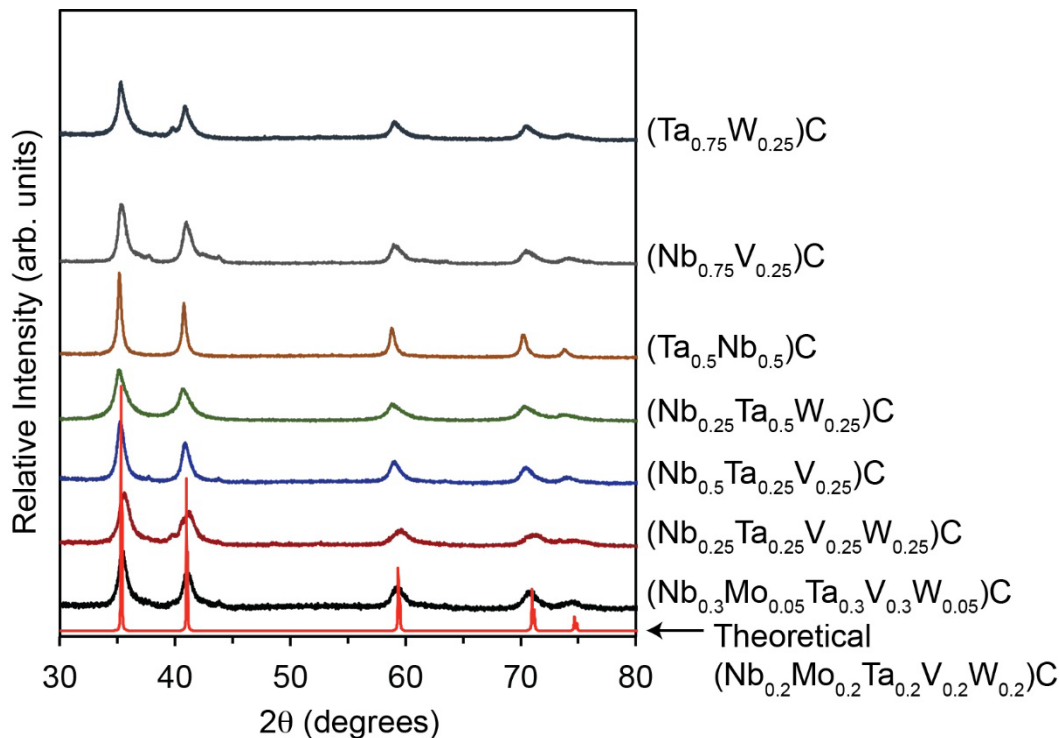


Figure 1 – X-ray diffraction patterns of multiple-metal carbides formed via solvothermal synthesis.