## A Review of Additive Manufacturing Methods for Tungsten Heavy Alloy

Michael T. Stawovy H.C. Starck Inc. 21801 Tungsten Rd., Euclid, OH, USA <u>mike.stawovy@hcstarck.com</u>

## Abstract

Tungsten heavy alloy is a powder metallurgy material that is often used in the as-sintered material condition. As a result, there have been several research efforts to demonstrate that this material can be produced using powder metal-based additive manufacturing methods including binder jetting, directed energy depositon and powder-bed fusion. This paper will review the current status of research on this material and compare the advantages and challenges of the different additive manufacturing methods that have been attempted.

## Introduction

Tungsten heavy alloys (WHA) have a chemical composition that is typically 90-97wt% W combined with alloying additions of Ni, Fe, Cu or Co. It is historically manufactured using a powder metallurgy process to blend, compact and sinter elemental powders. A typical manufacturing process flow is shown in Fig. 1.



Figure. 1. Manufacturing process flow for producing tungsten heavy alloy