Poster Session | F. From Microstructure to Properties: Mechanisms, Microstructure, Manufacturing

[PO-F2]Poster Session 2

Symposium F

2018年10月31日(水) 17:45 ～ 20:00 Poster Hall

[P2-45]Numerical and experimental investigation of liquid metal dealloying of Cu-Ni alloy in liquid silver.

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Liquid metal dealloying has emerged as a promising technique to produce finely porous structures of various nature (non-noble metals, refractory metals or semi-conductors) presenting a high surface area, valuable in a numerous applications (catalysis, battery materials, sensors,...). This process consists in emerging a binary precursor alloy (i.e. Cu-Ni) in a liquid metal (Ag) chosen such that only one element of the precursor alloy (Cu) dissolves into the metallic melt while the other element (Ni) reorganizes into a porous structure. We investigated the formation of this microstructure based on the ternary phase diagram of the Ni-Cu-Ag system. First, we developed a quantitative phase-field model to investigate the initiation of this dealloying process. The phase-field method is particularly adapted to investigate this kind of free-boundary problem and the complex morphogenesis of the structures, but is enable to reach the experimental time and size-scales. In a multi-scale approach, we use phase-field results and experimental observations to develop a macroscopic diffusion model able to reproduce the kinetics and the composition profiles obtained experimentally. Also, based on this work on the Cu-Ni-Ag model system, we were able to generalize our findings to other systems and assess the potential of other systems to form finely porous microstructures upon dealloying.