



GUEST EDITOR'S MESSAGE

Microwaves & Metals



Everyone possessing a microwave kitchen oven, and taking the time to read the instruction manual, is certainly aware that “no metal objects should be inserted in the oven cavity”. Basically, there are two things that happen when microwaves encounter a metallic object; the metal reflects the microwaves or microwaves set up electric currents in the metal, eventually leading to arcing and other unwanted phenomena. However, even without knowing, we are currently using metals in our microwave kitchen oven, for instance when preparing popcorns (and hence why the microwave popcorn bag is labeled “this side up”), or ready-meals. As a matter of fact, microwave susceptors are semitransparent metal sheets used to enhance local dissipation of power in a microwave heating process.

Microwave processing of metal-based materials is rapidly emerging as a fast and energy-efficient tool in powder metallurgy, involving a large number of processes such as debinding, sintering, melting, joining and thermal treatments. Microwaves are successfully used to sinter a wide variety of near net shape metal compacts with final properties comparable or higher than the conventionally sintered counterparts. Understanding and possibly predicting the results of microwave-metals interactions, especially in the powder metallurgy field, is nowadays gaining the interest and efforts of the scientific community, trying to give an explanation in terms of induced currents, presence of possible thin dielectric layers or breakdown phenomena. Nevertheless, despite the availability of predictive models and dedicated simulation tools, microwave processing of metals is encountering an increasing attention and application in both academia and industry.

This special issue is intended to cover fundamental studies of microwave-metals interaction, as well as of applications of microwaves to metals processing and for the fabrication of new composites or intermetallic materials, contributing to improve the current understanding of microwave interactions with metals and expand its field of application.

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