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Properties of mechanically alloyed Fe-Al-Si alloys compacted by spark plasma sintering

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The Fe-Al-Si alloys are of interest due to their excellent properties including high hardness, strength, wear resistance and resistance against high-temperature oxidation. In many cases, the properties of such alloys are comparable or even outperforms the stainless steels or nickel super alloys. Since the chromium can be again considered as a critical raw material which shortage might influence a wide range of possible applications, the Fe-Al-Si-based alloys can be utilized as a viable substitution. The Fe₈₀Al₂₀Si₂₀ (wt. %) alloys were prepared by mechanical alloying (MA) and compacted by spark plasma sintering (SPS) technique. The influence of either the conditions of MA and consequential compaction via SPS on the resulting microstructure, phase composition and mechanical properties was evaluated. For the mechanical alloying, the amount powder batch 5 or 20 g was tested in relation to the kinetics of phase's formation as well onto the overall character of microstructure and mechanical properties. The compaction via SPS combined pre-loading prior to reaching compaction temperature and vice versa while current flow characteristic variations were also tested. Moreover, the high-temperature high-pressure compaction (HTHP) done at several orders of magnitude higher pressures of approximately 6 GPa was also tested. Based on the results, the proper conditions for mechanical alloying and consequential compaction were chosen to yield maxima of the materials.

Biography

Filip Prusa has completed his PhD at the age of 30 years from University of Chemistry and Technology Prague. He is working at the Department of Metals and Corrosion Engineering as the assistant professor. He has published 64 papers in reputed journals and conference proceedings and has been serving as a reviewer for several journals.

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