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# Improving the strength of Zn-Mg-Ag bioabsorbable alloys by adjustment of fine-grained microstructure using powder metallurgy techniques.

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Zinc-based materials are considered promising candidates for applications like medical devices including fixation devices for fractured bones or stents. Due to the high demands on mechanical and corrosion properties and excellent biocompatibility, magnesium and silver have been selected as alloying elements. Biocompatible magnesium supports especially the increase of strength and silver is believed to improve material plasticity and antibacterial properties. Powder metallurgy processing techniques including mechanical alloying (MA), spark plasma sintering (SPS) and extrusion were selected for materials preparation to support the formation of finer microstructure. Studied alloys of various compositions up to 1 wt. % of Mg and 1 wt. % of Ag were prepared from pure powders of Zn, Mg, Ag by the combination of stated methods and suitable parameters. Finally, the microstructure and mechanical behavior (compressive, flexural test, tensile test) of prepared materials were studied in detail.

The obtained result indicated that the application of MA enables the formation of oversaturated Mg in Zn and very fine-grained microstructure containing both grains and intermetallic phases of size in tens to hundreds of nanometers, however, the application of extrusion led to the coarsening with a final grain size of about 4 micrometers. The improvement of the strength of materials by SPS was partially neglected by the existence of thin oxide shells at the interface of sintered powder particles, therefore better properties with the ultimate tensile strength of about 300 MPa were obtained after compaction of powders using extrusion.

*Keywords: zinc, bioabsorbable materials, powder metallurgy, microstructure, mechanical properties*

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