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Preparation of Degradable Porous Mg Alloys by Using Spherical NaCl

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Summary

Mg and its alloys are very lightweight structural materials having a density with 1.8 g/cm^3. Magnesium (Mg) has also been recognized as a promising biomaterial because of its excellent mechanical properties and its favorable characteristics of being biodegradable and bioresorbable. Biomedical application of Mg alloy such as stent and screw has already been reported. The development of porous Mg and Mg-based alloys has been of great interest because Mg materials has the potential to serve as a degradable scaffold for bone substitute applications. In this study, porous Mg alloy was prepared by melting of Mg alloy and spherical NaCl composites and subsequent leaching, and their mechanical and degradable properties were examined.

Spherical NaCl powder was prepared by melt ejection methods. NaCl was melted in a quartz nozzle at 900℃ and ejected through the small hole at the top of nozzle by Ar gas pressure. The ejected molten NaCl became spherical by surface tension and solidified. The obtained NaCl has a particle sizes ranging 0.5-2 mm. Mg alloy and NaCl with volume fractions of 50-70% were melted. After then, NaCl was dissolved in 1 M NaOH solution. The obtained porous Mg alloy possess pores, which size corresponds to the diameter of NaCl particle used, suggesting that the pore size can be controlled by changing the particle size of NaCl. The compressive test reveals that the porous Mg alloy prepared from 70 vol % NaCl had a typical feature of porous materials with large plateau region. The immersion of the porous Mg alloy in phosphate controlled saline causes a degradation of 2% in 2 days. In conclusion, the porous Mg alloy was obtained using spherical NaCl and showed a degradable property. For biomedical application, further investigation is needed to control the morphology and degradation rate of porous Mg alloys.