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Lotus-type Porous Metals: Properties and Applications

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Lotus-type porous metals with long straight pores are fabricated by precipitation of supersaturated gas when the melt dissolving gas is solidified. The main features of lotus-type porous metals are as follows; (1) the pores are straight, (2) the pore size and porosity are controllable, and (3) porous metals with pores whose diameter is as small as ten microns can be fabricated. According to our recent study lotus-type porous metals exhibit unique physical properties such as high damping capacity and high thermal conductivity, and superior mechanical properties. Furthermore, lotus-type porous iron fabricated using a pressurized nitrogen gas instead of hydrogen exhibits superior strength. The lotus-type porous metals can be applied to various functional materials: (1) aeroengine cooling components and (2) heat sink because of their higher heat transfer capacity, (3) artificial bone because of intruding new bone tissue into open pores, (4) golf putter developed by utilizing the merit of sufficient damping capacity, etc.

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Fabrication of cell structure by brazing and strip casting of magnesium alloy

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Twin-rollcastingisa promising process to produce magnesium alloy strip and sheet directly with high efficiency and productivity. As the development of strip casting, it has been available to produce magnesium alloy strip with fairly low cost and large yield. A new route has been devoted to produce thin sheet with excellent formability by strip casting and downstream warm rolling. As a further step, it brings a potential application to fabricate shaped sheets with pressing forming and then bond them into cell structure with welding or brazing technology.

In this study, an approach to this application was engaged to exlore its feasibility. Strips of wrought magnesium alloy AZ31B with thickness 2.5mm was produced by twin roll strip casting at casting speed 15m/min. The as-cast strip was treated by homogenization at 400 °C for two hours and then warm rolled into sheets with thickness less than1 mm. The rolling sheet was formed into required shape with pressing mould by means of its formability. And then the shaped sheet was brazed in a vacuum furnace. A perfect honey cell was fabricated by this way. The density of this structure could achieve 200kg/m^3. The effect on the brazing process of the casting-rolling sheets were investigated. And technical factors affecting the density of this super light structure were discussed finally.