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An investigation on structural properties of pure Al foam manufactured by powder metallurgy using TiH_2 foaming agent

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Abstract
Aluminum foams are a new generation of materials and have unique features and considerable applications in the manufacturing industry. In this research, Al foams were produced with titanium hydride as foaming agent by powder metallurgy method. Amounts of TiH_2 powder were 0.5, 1 and 2 wt. %. Partial sintering was performed at 400 °C and foaming temperatures were changed from 750 °C to 850 °C. The effects of foaming agent weight percent and heating parameters were investigated by comparing structural properties of final foams. Macroscopic examinations showed that foams containing 1 wt. % TiH_2 manufactured at 800°C have 77.8% porosity with the most uniform structure.

Keywords*:* Aluminum foam, Powder metallurgy, Titanium hydride, Porosity.

1. Introduction

Closed cell aluminum foams have considerable characteristics, such as efficient energy absorption, excellent stiffness to weight ratio and vibration damping [1،2]. Today, they are widely used in insulation, automotive and aerospace industry [3]. They are formed by several processes. One of the methods to produce Al-foams is based on powder metallurgy (PM). In this route, pure aluminum or Al alloy powder is mixed with a foaming agent (such as metal hydride or carbonate). Then the powder mixture is compacted by cold or hot pressing. The precursor is foamed by heating above the melting point of the matrix material [1].The foaming agent decomposes during the heating process. The released gas leads to form a porous structure [4].

PM method has many advantages, for example, making net- shaped foams is possible by this route. Furthermore, ceramics and fibers can be added to metal foams and there is flexibility in alloy choice [5]. Therefore, nowadays this method has greatly improved compared to the other methods.

Appropriate foaming agent plays an important role in obtaining higher expansion of foam and required structure. As the previous researches show, titanium hydride is a common blowing

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