

# Metal Injection Molding (MIM) with Magnesium

## SF<sub>6</sub> free production of complex magnesium parts

Patent status:

EP 2246074 (CH, DE, ES, FR, GB, IT, NL, PT) granted

US 8591803 granted

### Challenges

Small, complex formed magnesium parts have been able to be produced so far by very effortful conventional processing techniques and under the use of sulphur hexafluoride (SF<sub>6</sub>), the strongest known greenhouse gas. Alternative processing techniques as there is metal injection molding (MIM) of magnesium were held as not possible.

### Technology

At the Helmholtz-Zentrum Geesthacht a new technology is developed that for the first time makes it possible to handle magnesium by MIM and completely free of using SF<sub>6</sub>. MIM gives the opportunity to a cost-effective, near-net-shape production of small, complex formed parts in high quantities. Furthermore the MIM-process makes it possible to have very fine and dens micro structures, which are the basis of excellent properties; on the other hand there are also highly porous structures possible.

Initial samples of the MIM-product can be assembled with a special 3D-prototyping. This way cost and waiting times for injection molding parts can be reduced and magnesium parts are rapidly and cheaply ready for initial tests.

### Areas of Application

Magnesium possesses in regards to aluminum one third less the density, and at the same time a higher specific strength that makes it ideal for light weight. The biodegradability of magnesium combined with its high stability makes new types of medical therapy possible. Also for applications in the field of battery technologies the importance of magnesium is steadily increasing. Of interest is the nearly twice as high volumetric capacity, the missing tendency to form dendrites and a high resource availability compared to lithium.

That makes the technology for a multitude of demanding applications very interesting.

### Development Status

The commercial applicability is – in regards to the chosen alloy – given. Initial samples were already produced; the applicability of the process is proved.

### Exploitation Opportunity

Helmholtz-Zentrum Geesthacht offers the described technology for in-licensing and/or for the further development and exploitation. Within the scope of a cooperation, interested companies can be supported in adapting this technology to their specific requirements.

### Publication

M. Wolff, et al., Metals, Vol. 6 No. 118 (2016), DOI: 10.3390/met6050118.



Samples (left: bone screw; right: various MIM-parts) | Image: HZG/WBM

### Advantages:

- SF<sub>6</sub> free production
- Easy to adapt MIM to existing injection molding forms
- Direct net-shape production
- Homogenous properties
- Sheet thickness < 0,2 mm possible

### Application:

- Low specific costs for high quantities and complex geometries
- High material utilization
- Little to no post processing
- High recyclability of the sprue material

### Industrial Sector:

- Light weight (automobile, aircraft, etc.)
- Consumer goods (frames, e.g. mobile phones or cameras)
- Medical technology (biodegradable implants, drug-eluting implant, DES, etc.)
- Battery technology

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