Universidad Carlos III de Madrid

OO/UC3M/52- MANUFACTURING OF TITANIUM AND ALUMINIUM LIGHT ALLOYS BY POWDER METALLURGY

The Group of Powder Technology (GTP) of the University Carlos III has a wide experience in the development and processing of new materials by Powder Metallurgy (PM).
The mechanical alloying (MA) process, or high energy milling, allows the attainment of powders with compositions impossible to produce by other techniques, with improved properties for structural applications, where mechanical properties are the main requirement, and for applications where other specific properties are needed.
The identification of the specific needs of interested industrial sectors is a critical point in this development.

Description and special features

The Group of Powder Technology (GTP) of the University Carlos III has a wide experience in the processing of materials by Powder Metallurgy (PM). Among the materials under development in the GTP, Aluminium (Al) and Titanium (Ti) light alloys stand out due to the increasing industrial interest for the development of lighter components. PM is one of the processing technologies that recently has aroused more interest for the processing of light alloys due to its advantages: as it is a near-net-shape process, it permits the reduction of costs by energy and material savings and requiring less secondary operations (as machining). Those aspects are particularly critical for Ti alloys.

The development of Al alloys comprises commercial compositions of series 2xxx and 6xxx, process by pressing and sintering or powder extrusion. Those techniques permit to modify the compositions and to adapt to the specific requirements.

In the case of Ti alloys, the GTP is working on the development of alloys with compositions different to conventional, by using lower-cost alloying elements (mainly Fe) that simultaneously permit to reduce the cost of the material and to reach mechanical properties equivalent to the most popular Ti-6Al-4V alloy, obtained by conventional metallurgy. The PM process permits to adjust the composition and contributes to the reduction of the global costs due to the previously mentioned advantages.

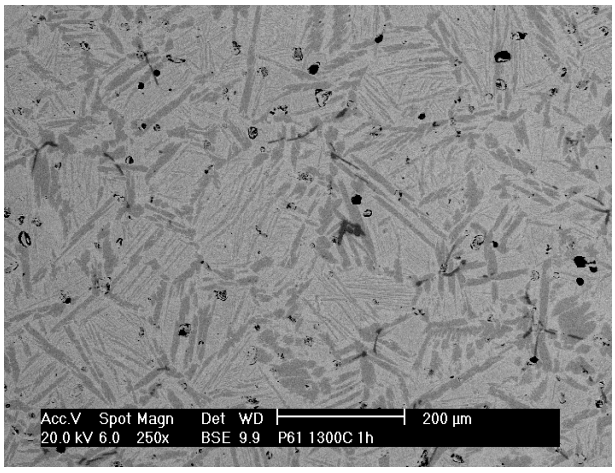

Fig. 1. Microstructure of a PM Ti alloy

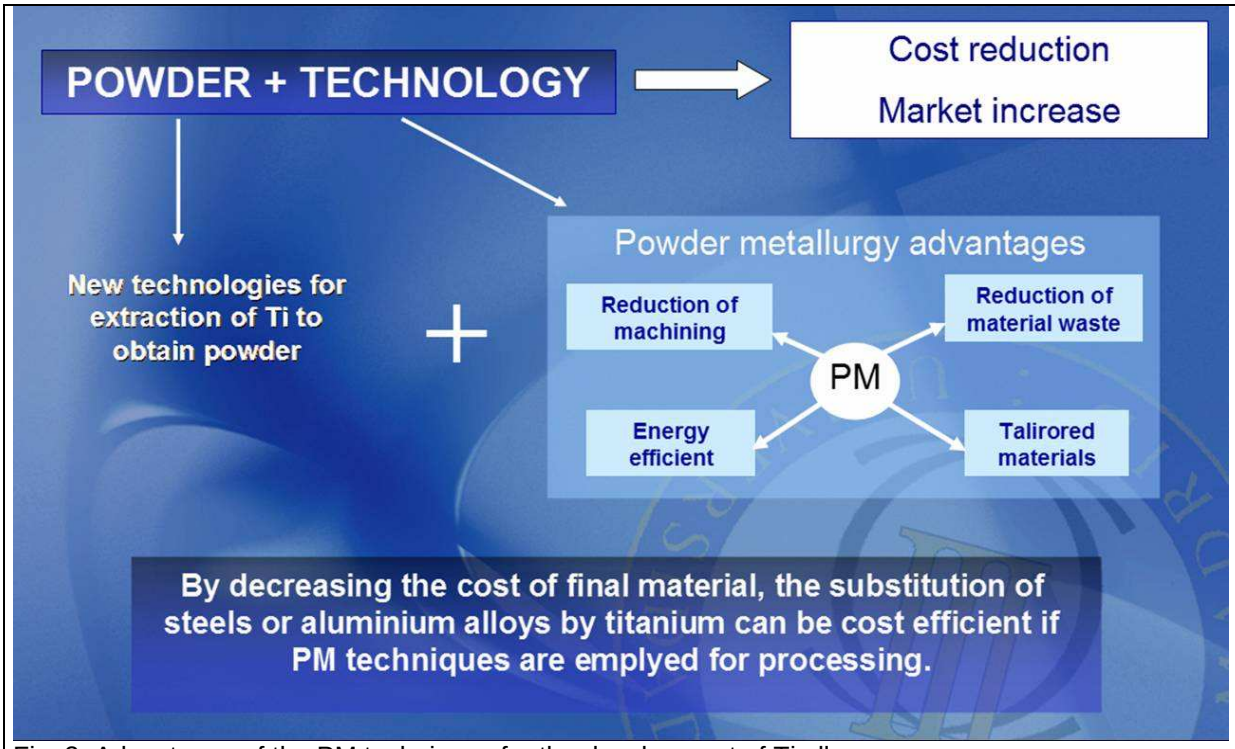

Fig. 2. Advantages of the PM techniques for the development of Ti alloys

Innovative aspects
The employment of powder metallurgy techniques for the manufacturing of Ti components, widening their sectors of application, in particular the automotive industry.

Competitive advantages
Reduction of costs related to both the raw material and the processing, reaching properties equivalent to that of conventionally manufactured components.

Technology Keywords
Metals and alloys; Materials properties, corrosion / degradation; Composite Materials

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