Researchers develop impurity-free process for powder injection molding of titanium components

March 8 2005

New method could reduce fabrication costs and increase use of titanium and other metals

Researchers at the Department of Energy's Pacific Northwest National Laboratory have developed a new method for powder injection molding of titanium and similar materials to form components for advanced engineering applications.
Titanium offers high specific strength and excellent corrosion resistance, making it ideally suited to the automotive, aerospace, chemical production and biomedical equipment industries. However, use of injection molded titanium components has been severely limited by alloy impurities directly attributable to the current process.

The PNNL method overcomes these problems, allowing powder injection molding to be readily used in preparing components from alloys of titanium, tungsten, and niobium, as well as other reactive refractory materials. The key to the PNNL process is a proprietary binder that is cleanly removed during sintering and leaves no impurities that can cause degradation in material properties.

In addition, the porosity of components produced by the PNNL process can be tailored for a variety of specialized applications, including the design of self-lubricating parts and biomedical implants. This is accomplished by including easily removed fugitive phases in the powder

mixture and by controlling the subsequent debinding and sintering heat treatments.

Derived from plastic injection molding, powder injection molding employs a mixture of metal powder and polymeric binder. It is a well established, cost-effective method of fabricating large volumes of small- to moderate-size, net shape components and can be used to produce parts of complex shape. Because fabrication temperatures are relatively low (~150 - 250°C), the molds employed in powder injection molding are less expensive than those used in other forming techniques, such as die casting or forging.

Source: Pacific Northwest National Laboratory