High-performance tungsten-based materials make casting processes more cost-effective and improve quality

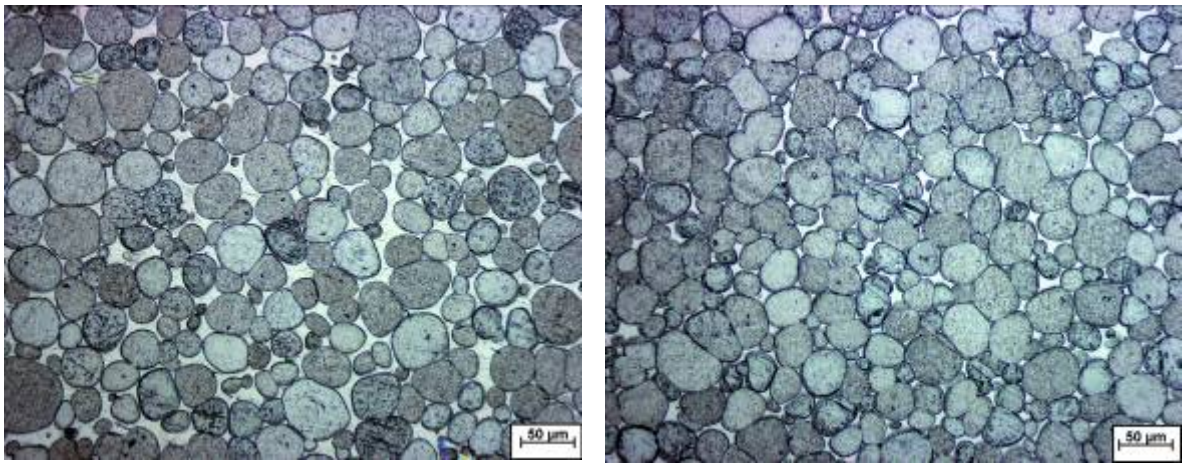
Fire cracks and corrosion are the most common types of casting tool damage in light metal casting. Usually such damage reduces product quality, which may worsen even further under some circumstances due to adhesion or inadequate heat dissipation. With its Triamet A product family, a tungsten-based heavy metal alloy, Bayerische Metallwerke GmbH offers an innovative and ecological alternative that avoids these problems. Thanks to a tungsten content of up to 98 percent, the Triamet A materials withstand the stresses of frequent temperature changes in the casting process over the long term and set themselves apart with high corrosion resistance compared to aluminium and copper alloys. The various tungsten alloys are being presented at this year's ALUMINIUM 2016 trade fair in Düsseldorf.

With many types of hot work steel used in light metal casting for the production of tools, the hardness and strength decrease relatively quickly due to the high thermal stresses. Crack formation caused by thermal fatigue of the material is common. This can reduce the quality of the end product and lead to significant financial costs and time expenditures for repair work and loss of use.
With the Triamet A product series, Bayerische Metallwerke GmbH offers various tungsten-based alloys that can avoid these problems. Tools made of Triamet A are highly resistant to liquid aluminium and magnesium. This can increase the service life by 10 to 500 times compared to conventional materials, depending on the field of application and the type of casting process. The negligibly small alloy formation tendency and the formation of a natural separating layer

counteract sticking of the work piece to the casting mould, which has a positive impact on product quality as well.

Low thermal expansion coefficient prevents fire cracks

Fire cracks in casting moulds are caused mainly by thermal fatigue due to alternating compressive and tensile stress on the tools. The lower the thermal conductivity and the higher the thermal expansion coefficient of a material, the greater this stress will be. Compared to the commonly used steel, the thermal conductivity of Triamet A at 70 to 105 W/mK is about 3 to 5 times higher while the thermal expansion coefficient at 5.2-6.5 [10^{-6} K^{-1}] is simultaneously only about 50 percent. This greatly reduces stresses in the tool. The high resistance to temperature changes significantly reduces the fire cracking tendency and therefore greatly increases the service life.



The lower the proportion of the binder phase, the higher the density will be – indicated here by the numbers “17” and “18”. However, the ductility of the heavy metal also increases as the binder proportion rises.

Source: Wolfram Industrie

Sintering process at 1,500 °C thanks to nickel and iron binder phase

Bayerische Metallwerke GmbH uses a nickel and iron binder phase for the production of Triamet A, added to the tungsten powder at the rate of two to ten percent. Nickel acts as a catalyst that accelerates

diffusion processes on the surface of the tungsten power and thereby reduces the sintering temperature by about 1,000 °C. Subsequently the Triamet green parts are sintered at about 1,500 °C – in contrast to the 2,500 °C required for pure tungsten – so that a unique microstructure with a spherical tungsten phase encased by the binder phase is formed. All Triamet A series products set themselves apart with a very high density from 17.0 ± 0.15 g/cm^3 for Triamet A17 to about 18.8 ± 0.2 g/cm^3 for A19.

The Triamet A materials are used primarily in gravity diecasting and high-pressure diecasting, for instance for the production of aluminium rims and cylinder heads.

Source: Wolfram Industrie

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