

Oxygen content in PM HIP 625 and its effect on toughness

Wednesday, 6 December 2017 12:25 (25 minutes)

Oxygen control during powder manufacturing and handling is crucial when manufacturing HIPed parts. The influence of elevated oxygen content on mechanical properties is something that has been debated and investigated for many years. The general consensus in the industry is that oxygen has a very detrimental effect on the toughness of the material if present in excessive amounts.

The detrimental effect of oxygen content on the impact toughness of the material has resulted in HIPed specifications, both existing and under development, with limits on the oxygen content in the material. Many specify a relatively low limit on oxygen content at e.g. 120 ppm which can have adverse effects on yield in powder manufacturing which might increase costs without accomplishing the desired effect of ensuring sufficient toughness. As this study show, oxygen content and chemistry alone is not enough to describe the effect of oxygen content on the HIPed material. Setting a limit at e.g. 120 ppm will not guarantee that one gets better properties or even reaches the desired properties of the material. The study show it is important where the oxygen is located in the powder and to separate bulk oxygen content and the surface oxygen content, where the latter has a more pronounced effect on toughness. In the study four batches of alloy 625 have been investigated, all with only relatively small variations in oxygen content but with drastically different toughness and differences in how oxygen is distributed in the material.

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Materials

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Session Classification: Materials