HIPing the materials of the future

The demand for higher performance materials is growing across a diverse range of industries. ANSTO is leading the way in meeting this market demand. It is one of the few facilities in the world able to produce denser, more reliable and longer lasting materials on an industrial pilot scale using Hot Isostatic Pressing (HIP) Technology.

The technology

ANSTO has developed an innovative thermal treatment based on the Hot Isostatic Pressing (HIP) process to create the materials of the future. The process uses very high heat and pressure to reduce the impact of defects by eliminating pores or improving bonding with the parent material, improving the microstructure and mechanical properties, and guaranteeing the designed lifespan of engineering materials. It also allows for the consolidation of combinations of materials to produce a wide range of new-generation alloys that cannot be readily made via melting.

The benefits to industry

The HIP process is a perfect example of ANSTO’s unique ability to use nuclear knowledge and expertise to conduct research and development of material structure, and then scale it up for industrial products. This is proving to be of immense benefit, especially to industries making customised high-performance components.

Important applications of ANSTO’s HIP process include:

- Creating improved medical implants such as artificial bone (hydroxyapatite), knee, hip, spinal and knuckle joints which are guaranteed to survive their designed lifespan
- Producing dense glass for high-strength windows for spacecraft or military applications
- Making complex castings (not producible by forging), with comparable properties to forged component at far less expense
- Making specialist parts for luxury sports vehicles, racing cars and motorbikes, luxury sport and leisure goods such as titanium golf club heads
- Creating future-ceramics, including ceramic armour and transparent bullet-proof windows for defence vehicles, specialised tools for the machining industries, boron nitride for foundries
- Making diamond and tungsten carbide cutting tools for exploration, mining, tunnelling and petroleum industries
- HIP-ing gallium arsenide for the electronics industry as semiconductors, light emitting diodes, lasers, solar cells and other optoelectronic devices
- Making sputtering target materials for the electronics industry suitable for vapour coatings

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