# PEEK performance

In recent years, the medical industry has increasingly turned to synthetic polymers and biomaterials for implants, thanks to beneficial qualities such as flexibility, biostability and biocompatibility. Marc Knebel, director of VESTAKEEP Medical at speciality chemicals company **Evonik**, tells *Medical Device Developments* how the particular benefits of PEEK are leading to its adoption in a variety of new applications.

Materials such as titanium and cobalt-chromium have traditionally been used as the go-to solutions for orthopaedic implants, their biostability and durability making them a safe, reliable option.

However, high-performance plastics are increasingly being used in their place, including polyetheretherketone (PEEK), which not only offers equivalent biostability and strength but additional benefits too.

Marc Knebel, director of VESTAKEEP Medical at Evonik, explains how VESTAKEEP PEEK offers key advantages in a setting such as a spinal implant.

"Compared with other plastics, PEEK is very biocompatible, so nothing leeches out of the material when it is implanted," he says. "It also demonstrates very good biostability, so it will not be destroyed over time by the human body as some other plastics are.

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"But the real advantage over titanium is that you don't see a PEEK implant on the X-ray; instead, you can look through it. Another positive is that the material thickness is very close to that of cortical bone and so it allows a little bit of flexibility, meaning that micro-movement is possible, which also helps to reduce stress shielding."

For more than a decade, PEEK has been used extensively in orthopaedics and spinal implant applications such as cervical cages, with many CE certificates and FDA approvals across different products. Its wider uses include craniomaxillofacial and cardiovascular implant applications, as well as non-implant settings such as medical devices, endoscopy equipment, grips and handles.

Its trusted position in these areas is also leading to expansion into new fields, such as dental and sports medicine.

### Suitability for medical applications

PEEK is also well suited to medical applications such as pump housing or access ports implanted into the body; for example, for chemotherapy patients. Whereas other plastics would be affected by the harsh pharmaceutical substances used, PEEK's resistance to chemical reactions means that it remains stable and reliable.

This resistance also means that it is naturally more difficult to bond to than other plastics and so Evonik has worked with speciality manufacturers to develop a number of solutions and pre-treatments. Manufacturing with PEEK is a straightforward process, either by means of injection moulding or a combination of extrusion technologies and machining; over the coming years, 3D printing may also provide the means to 'print' PEEK implants.

"There is a bright future for PEEK in medical implants and medical devices," Knebel confirms. "PEEK has excellent properties to fulfil market requirements and the great thing is that you can also modify it; for example, by using surface treatment to enhance the osteoconductivity or inserting additives in compounding to modify certain properties."

In addition to PEEK, Evonik offers a number of other polymers with differing properties. RESOMER is highly suited to suture anchors or ligament screws for bone fractures in small children and babies, because its natural biodegradable qualities remove the need for a second reverse operation.

"It depends entirely on the indication," Kneber says. "You can define the mechanical strength of your suture anchor and then apply the right 'recipe' so that it will biodegrade after a certain time. For other patients, you may find that higher forces will act upon the implant and so you need a higher-strength material."

Applications for Evonik's other high-performance polymers encompass contact lenses, catheters, medical-grade foam table tops, sterilisable trays, blood filtration equipment and medical imaging equipment.

"Evonik has identified healthcare and the medical industry as a blockbuster issue, and is investing time and resources into developing new solutions from its new research centre in Alabama," Knebel reveals.

With Evonik's four decades as a world leader in speciality chemicals, customers can expect the result to be an ever-growing portfolio of polymers and biomaterials that help to further advance medical technology. ■

**Further information**
Evonik
www.medical.vestakeep.com