

Innovative Research Solutions with Industry

Medical Devices

CLIENT:

Medical Technologies Sector

AREA:

Precision Engineering & Manufacturing



Fabricating coupons of bioresorbable polymers for use in medical technologies



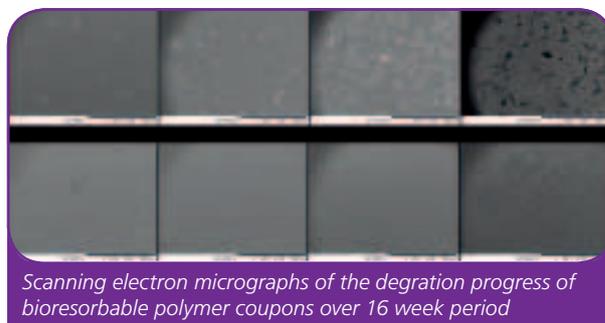
Institutes of Technology Ireland

The Medical Device Technology sector is a globally significant manufacturing activity that is of key economic importance to Ireland. The project described here is of relevance to a range of companies operating in this sector in the state.

Medical device technology is evolving toward a paradigm in which the devices play a therapeutic role in addition to a passive, structural role – so-called bioactive technologies. This is particularly true in areas where convergence of pharmaceutical and device technologies is a feature such as tissue engineering and targeted drug delivery.

Bioresorbable polymers are set to play an increasingly important role in novel products in this arena and consequently industry needs to understand the effect that manufacturing steps – such as laser welding which is widely utilised in the medical technologies sector – will have on the biodegradation rates of the materials involved.

The Precision Engineering and Manufacturing (PEM) Centre at IT Sligo has a dedicated polymer welding workstation as well as access to a wide range of equipment for microscopic inspection, mechanical testing and chemical analysis. The Centre also possesses over 50 man-years of industrially focused research expertise in the areas of laser-based manufacturing, biodegradable polymer processing, engineering design and quality control. Through its network of industrial contacts in the medical technologies sector, the



Scanning electron micrographs of the degradation progress of bioresorbable polymer coupons over 16 week period

PEM Centre is well positioned to disseminate this expertise to industry in Ireland.

Research by the centre to date has involved fabricating coupons of bioresorbable materials. These coupons were laser-welded and the resulting assemblies were degraded in an incubator under conditions similar to the biological environment found in the body. Quantitative indicators of the degradation process were made by careful mass-loss measurements and chemical analysis of degradation by-products. Microscopic inspection was also carried out at regular intervals, since, in implant applications, it is important to monitor the degradation/fragmentation process.

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•→ to the student working on the project. Industry sector feedback has been provided to the project via an Industry Open Day organised by the PEM Centre and through bilateral interactions between relevant companies and the project team.

The research has provided clear information on a measurable effect that laser welding has on the degradation rate of a particular bioresorbable material. It has also enabled the development of a framework in which other materials can be assessed.

The Centre envisages that the research activity will provide the basis for focused collaborative projects with specific industry partners seeking to develop new products in this area. The team will be seeking to identify suitable industrial partners for the next phase of development. ■

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“The global trend in medical technologies is strongly focused on the convergence of pharmaceutical and devices technologies. Ireland is recognised as an international leader in these areas and therefore it is essential that we stay at the forefront of innovation and new product development. Recent years have seen the establishment of many innovative SMEs in the area of medical device design and development. These companies will require support in terms of knowledge development and training to sustain their activities, so it is important that third level institutes should be proactive in their choice of research activities. Because of its direct applicability to manufacturing processes, this project - along with others in the area of bioresorbable polymer processing underway at the PEM Centre, has the potential to be a key enabling technology for novel product development.”



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