**Table 4.** Biodegradation characteristics of commonly used polymers in SPI formulations. Adapted from Gunatillake and Adhikari 2003.

| Polymer | Melting Point (°C) | Glass Transition (°C) | Approximate degradation time (in months) | Mode of Degradation and degraded products |
|---|---|---|---|---|
| PGA | 225–230 | 35–40 | 6–12 | Hydrolysis & GA |
| PLA | 173–178 | 60–65 | >24 | Hydrolysis & l-LA |
| Poly(d,l-lactic acid) | Amorphous | 55–60 | 12–16 | Hydrolysis & d,l-LA |
| PLGA (85/15) | Amorphous | 45–55 | 1–6 | Hydrolysis & d,l-LA & GA |
| PCL | 58–63 | –65–60 | >24 | Hydrolysis & Caproic acid |
| PPF | Amorphous | 31.9 for infinite MW | Several months | Hydrolysis & Fumaric acid, propylene glycol |
| PLEC | No details | No details | Weeks to months | Hydrolysis & CL & d,l-LA |
| PEC | No details | No details | Weeks to months | Oxidation & Ethylene carbonate |

## 5. Currently Marketed SPI Systems

Even though this *in situ* forming technology shows great promise in the field of drug delivery, currently there are only a small number of devices that are marketed and approved for use by the FDA. Initial work using this technology completed by Dunn and co-workers surfaced in the 1990s with Atridox® being the first system to be released onto the market after FDA approval in late 1998, marketed by Tolmar Inc. in the United States. The system consists of poly DL-lactide, NMP and doxycycline and the MHRA granted a marketing authorisation to Atrix Laboratories Limited in the United Kingdom on 1st March 2003 for Atridox® (MHRA 2003). Atridox® is licensed for the treatment of chronic periodontal disease and it utilises the initially liquid state of the polymer solution to allow injection of the antibiotic and polymer formulation into the periodontal pocket before the controlled release implant is formed. This system has been reported to allow the release of doxycycline over 21 days (Stoller et al. 1998). Advantages of this product detailed by the company in relation to marketing draw on the advantages of *in situ* forming devices. Atridox® allows local treatment of the periodontal disease via direct application of the antibiotic and also that removal is not required as the system of bioabsorbable.

A number of clinical studies were conducted to determine the benefits of this treatment compared to previously licensed treatment modalities. Garrett, Johnson and Drisko in 1999 conducted two multicenter studies comparing locally delivered doxycycline to oral hygiene measures, scaling and root planning and also a placebo measure. They determined that the local delivery of doxycycline resulted in a gain in clinical attachment and also a reduction in probing depths. A similar study comparing the local delivery of doxycycline in a controlled release manner in comparison to scaling and root planning indicated that the local delivery resulted in a reduction in bleeding on probing (Garrett et al. 1999).