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Controlling the Degradation of Bioresorbable Polymers[1] ISTVAN MORITZ, BRIAN CROWLEY*, ELIZABETH BRUNDAGE*, Materials Science and Engineering, Rensselaer Polytechnic Institute, DENIZ RENDE, Center for Materials, Devices and Integrated Systems, RAHMI OZISIK, Materials Science and Engineering, Rensselaer Polytechnic Institute — Bioresorbable polymers play a vital role in the development of implantable materials that are used in surgical procedures, controlled drug delivery systems; and tissue engineering scaffolds. The half-life of common bioresorbable polymers ranges from 3 to over 12 months and slow bioresorption rates of these polymers restrict their use to a limited set of applications. The use of embedded enzymes was previously proposed to control the degradation rate of bioresorbable polymers, and was shown to decrease average degradation time to about 0.5 months. In this study, electromagnetic actuation of iron oxide magnetic nanoparticles embedded in an encapsulant polymer, poly(ethyleneoxide), PEO, was employed to initiate enzyme assisted degradation of bioresorbable polymer poly(caprolactone), PCL. Results indicate that the internal temperature of iron oxide magnetic nanoparticle doped PEO samples can be increased via an alternating magnetic field, and temperature increase depends strongly on nanoparticle concentration and magnetic field parameters. The temperature achieved is sufficient to relax the PEO matrix and to enable the diffusion of enzymes from PEO to a surrounding PCL matrix. Current studies are directed at measuring the degradation rate of PCL due to the diffused enzyme.

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Deniz Rende
Rensselaer Polytech Institute

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