Abstract

With increasing changes in lifestyle, trauma cases and diseases, demand for biodegradable implants and scaffolds is continuously rising. A scaffold is a temporary structure implanted at an injured site to provide support and fixation to the damaged tissue, which can heal with time. At the completion of healing, the scaffold should disintegrate in the body without leaving any toxic residue or impacting other organs of the body. An ideal scaffold should be biocompatible, biodegradable and should have mechanical properties such as compressive strength and elastic modulus closer to bone such as for orthopedic applications. Moreover, scaffolds should be highly porous with interconnectivity to allow diffusion of nutrients for bone or soft tissue regrowth. However, currently available and popular scaffolds made of bio-inert materials such as Titanium, Cobalt-Cromium, Stainless steel, biodegradable polymers such as poly lactic acid (PLA), PLLA, poly urethane (PU) or ceramics do not completely fulfill the above requirements. Magnesium, on the other hand, is the best metal for bone scaffold purposes owing to its biodegradability due to corrosion inside a human body, biocompatibility, high specific strength and resemblance to human bone’s elastic modulus. However, the available literature for producing Mg-based porous structures is elusive and limited. The present work is an attempt to address these challenges by developing a highly porous topologically ordered Mg-based scaffold using liquid phase sintering. To overcome challenges associated with corrosion, a novel Mg10Zn4Y alloy was mixed with PLA to produce a highly porous structure and a coating of trimethoxysilane helped in improving the stability of samples in phosphate buffer solution (PBS) in a study of 4 weeks mimicking simulated body fluid in-vitro. Cell adhesion study shows excellent attachment of cells in Mg-alloy+PLA samples, making it suitable for biomedical scaffold applications in future.