(Royals et al. 1999). Graham et al. determined that the release rate of protein is directly influenced by the rate of phase inversion and morphology of the formed implant (Graham et al. 1999).

Once injected into an aqueous environment SPI system forms a polymeric implant that controls drug release over defined time period (Royals et al. 1999). A number of publications and patents over the last few decades have indicated that release can be modified so that SPI hydrogel implants can deliver drugs over 2-week to 6-month period. Fredenberg et al. 2011 identified three basic ways in which drugs could be released from PLGA-based matrices as (i) transport through water-filled channels, (ii) transport through the polymer, and (iii) due to dissolution of the encapsulating polymer. They deduced that the mechanism of release of encapsulated biopharmaceuticals, proteins and peptides, was through water-filled pores as these molecules are large and hydrophilic therefore transport through the polymer phase would be limited (Fredenberg et al. 2011).

An ideal prolonged drug release profile would conform to zero-order release kinetics. Typically the drug release profile from SPI hydrogel implants can be described as triphasic (Fig. 2); (i) a sudden burst release of drug that is attributed to a lag period before the implant forms after injection, where drug is released from the surface of the system through pores, (ii) a slow diffusion facilitated release of non-entailment drug molecules in the matrix, and (iii) degradation of polymer matrix in which once the molecular weight of the polymer reaches a lower threshold, erosion results in a second rapid phase of release in the profile (Zare et al. 2008; Astaneh et al. 2008; Ahmed et al. 2012). The rate of drug release can be attributed to a number of parameters such as molecular weight of polymer, concentration of polymer solution, solvent/solution hydrophilicity and system additives. Modification of theses parameters can allow tailoring the drug delivery. Following sections details the effect of each parameter on drug release from SPI hydrogel implants.

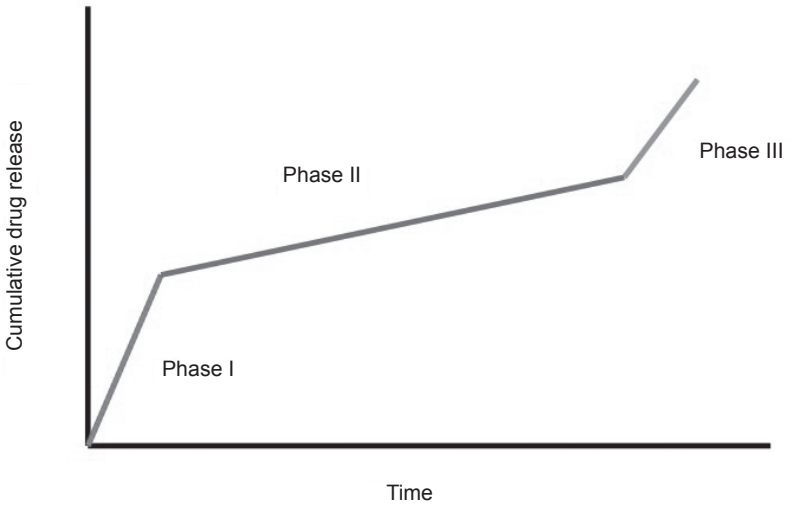

Fig. 2. Schematic representation of general drug release profile from solvent-induced ISFI.