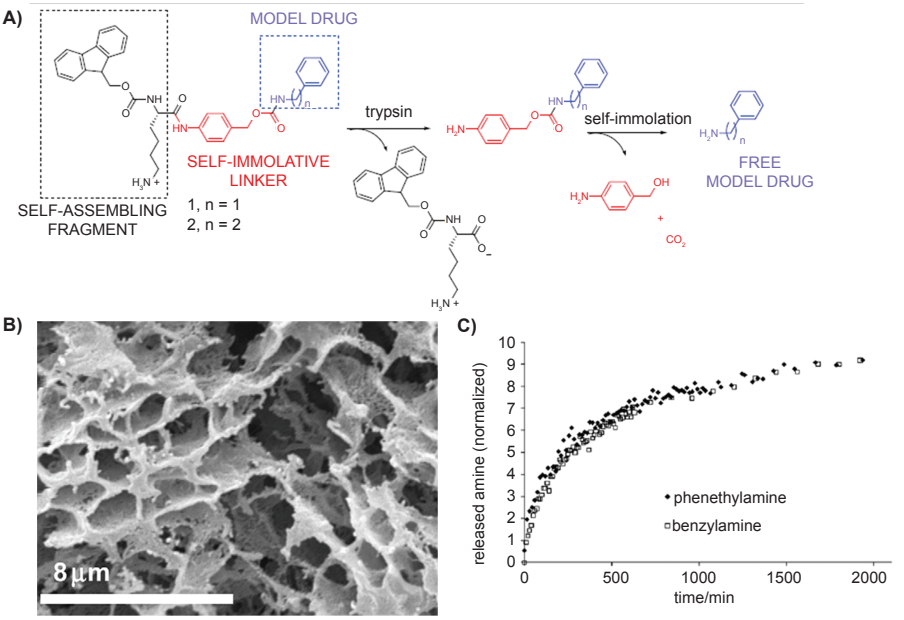

Fig. 7. (A) Schematic representation of possible mechanism of enzymatic cleavage and self-immolative hydrolysis of the pro-drugs. (B) Cryo-SEM image of sponge-like hydrogel (n = 1) and (C) Kinetic profile of the release of model drug amines. Adapted with permission from (Sáez et al. 2010).

In another study, Gao et al. exploited a tyrosinase enzyme to control a supramolecular disassembly process, which was considered to be potentially useful for controlled drug release in the case of elevated tyrosinase activity in malignant melanoma. Congo red (as a model drug) was incorporated within the hydrogel matrix assembled from aromatic tetrapeptide methyl esters, Ac-YYYY-OMe and Ac-FYYY-OMe (Gao et al. 2011). Upon treatment with tyrosinase, tyrosine residues were converted to quinone. This oxidation process resulted in the loss of π-π interactions between phenol rings and ultimately a gel-to-sol transition, which in turn resulted in release of model drug molecules. The incorporated model drug could be released in a controllable manner by using different enzyme concentrations.

In an interesting study, Vemula and co-workers combined both routes (pro-drug and drug encapsulation) to design a (dual) drug delivery system. Initially, they conjugated acetaminophen drug to fatty acids to form a hydrogelator, which is able to form a hydrogel. Upon enzymatic treatment (with lipolase), the hydrogel disassembled leading to single drug release. They also encapsulated curcumin (a hydrophobic anti-cancer drug) in the hydrogel matrix described above (Vemula et al. 2009). The formed hydrogel was degraded completely to form two non self-assembling components by the enzyme, lipolase, while releasing the encapsulated chemopreventive hydrophobic drug curcumin which is monitored by time depended UV-Vis spectroscopy. It was possible to control the drug release by manipulation of both the enzyme concentration the temperature.