Literature reports indicate that an important role in particle dispersability is played by the nature of organic function attached to the particle. In this regard, amino groups have shown to be more effective for redispersability as compared to thiol functions. Amino groups display charged nature under aqueous conditions, this makes them more hydrophilic compared to thiol groups, which accounts for their better redispersability. Another important factor is surface concentration of attached organic group. In case of MSNs where outer surface layer has been functionalized by surface hyperbranching polymerization, it is easier to redisperse contrary to MSNs where amino group is solely originating from the aminosilane used along with TEOS in the cocondensation synthesis. Polymers while getting attached or adsorbed onto the surface layer of MSN provide more steric stabilization, which ultimately leads to better dispersability of the MSNs.

19.6 DRUG RELEASE AND DISSOLUTION

Radim et al. have studied that cumulative release of a drug from microsphere is a function of immersion time, water/TEOS molar ration (R), and drug load. Increasing the amount of loaded drug increased the rate and amount of release. Microspheres with drug concentrations of 20 mg/g, which were synthesized using sols with R equal to 5 released 6% of the original load after 4 days, however increasing R to 8 enhanced the rate and amount of release making it 36% of the original load after 12 days. A major impact on release profile is also shown by the nature of particles. Even though emulsified microspheres and ground granules are synthesized from same sol having R equal to 8 and 30 mg/g drug, still there is great variation in their release profile. Radin et al. (2009) have reported short term and fast release of drug from granules in contrast to microspheres where release was slower and for longer duration. As shown in Fig. 19.9, the granules released 90% of the drug within 7 days, whereas the microspheres release 36% of the drug over 14 days.

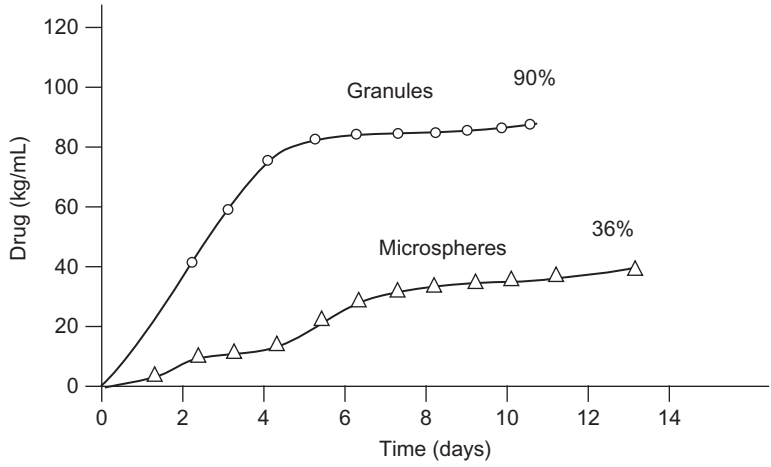

FIG. 19.9 Drug release from microspheres and granules as a function of immersion time in PBS.