For reaction temperature lower that 35°C, bundles of nanosized fibers having length of 8–30 nm and diameters of 40–85 nm were obtained. Upon further increasing the temperature to 40°C the fibers transformed to a different structure, mainly spherical particles having complex multilamellar vesicles with diameter 150 nm. As the reaction temperature was further increased to 60°C the multilamellar vesicular structure changed into mesocellular foams with spherical morphology with diameter of ~1 mm.

19.3.2 Rod-Like Mesoporous Silica

19.3.2.1 Additives

Various researches have reported the effect of additives on rod-like mesoporous silica. Ding et al. (2013) studied the effect of HCL concentration in the range 0.5–2.5 mol/L along with nonionic surfactants P123 as SDA. They concluded that acidity was key factor affecting growth of rod-like particles, increasing HCL concentration in the synthesis mixture decreased the length of rod-like mesoporous silica. Particles with rod-like morphology were synthesized by Zhou et al. (2007) when small amount of TIPB was added to P123 in molar ratio 2.9:1. TMB was successfully used by Xin et al. (2014) along with P123 surfactants to synthesize rod-like particles with length 800–1600 nm and diameters 350–650 nm. As an additive, TMB produced an average increase of 1.85 μm in the length of rod-like particles, in some cases the end of rod-like particles were curved.

19.3.2.2 Stirring Speed

A substantial role is played by stirring speed in determining the macrostructure of rod-like silica particles. Sun et al. (2006) reported that rod-like morphology was obtained when the reactant mixture P123/KCL/HCL/H_2O/TEOS was kept in static condition after addition of TEOS with constant stirring for 8 minutes. If the same reactant mixture was continuously stirred at constant temperature using the same reactant molar ratio fiber-like mesoporous silica was formed, these were rod-like units joined along the longitudinal axis to provide fibrous morphology. Jin et al. (2006) reported that stirring rate determines chiral structure, and it was observed that morphology for a 300 rpm stirring rate was not uniform, samples such as twisted ribbon-like and twisted rod-like structures were formed. Increasing the stirring rate to 400 rpm produced uniformly twisted rod-like structures with a hexagonal cross-section. An important effect was mentioned by Yu et al. (2011) according to them, aspect ratio of rod-like mesoporous silica decreased from 7.6 to 3.8 with gradual increase of stirring speed. Chen et al. (2015) found that rod-like mesoporous silica with optimal morphology were synthesized when NH_4OH was added under stirring conditions and TEOS was added in static conditions. Stirring has two important aspects: (1) it increases the diffusion of TEOS to the template by disrupting self-assembly of the templates and (2) it ensures spread of TEOS on to the template surface upon