CONCLUSION

Nanosized amorphous silica materials were prepared directly from tetraethylorthosilicate by template assisted sol-gel method. The organic acid template used in this study were succinic, malic, tartaric, citramalic, glutaric, adipic and mucic acid. The scanning electron microscopy images of silica from this study exhibited three morphologies which are spherical, plate and tubular shapes. The uniform spherical morphology is formed from non-template conditions, while mixture of tubular and sphere morphology are formed from tartaric and mucic acids template conditions. The diameters of the spherical shape are about 70 nm to 1.2 μm. Silica plate has length about 520-2200 nm. The diameter of silica nanotubes varied from 120 to 550 nm and the length of tubes ranged from 0.6-2.6 μm. Only polyhydroxycarboxylic acid templates (tartaric and mucic acid) can produce silica nanotubes because of the ability in forming hydrogen bond between themselves and with silanol. These tubes are found with one end opens and the other end terminates in a curved end. Silica nanotubes using mucic acid template are bigger than those using tartaric acid template. Shaking condition is more efficient than stirring condition in production of nanotubes. The FTIR bands at 1100, 800 and 470cm^{-1} and XRD spectrum support the amorphous materials.