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Thermally Stable Mesoporous Silica Spheres synthesized under Mild Conditions[1] CHRISTOPHER ZIEGLER, EUNYOUNG YOU, JAMES WATKINS, University of Massachusetts Amherst — Thermally stable, mesoporous silica spheres were synthesized using a one-pot technique under mild conditions. As-calcined silica spheres were shown to be highly porous with surface areas greater than 1000 m^2/g and pore volumes on the order of 1 cc/g. Pore walls were found to be highly resistant to collapse as a consequence of thermal treatment at temperatures exceeding 750 $^\circ$C or hydrothermal treatment in boiling water at temperatures exceeding 100 $^\circ$C for over 100 hours. ^{29}Si-^{1}H cross polarization NMR data indicate that the silica is highly condensed at the surface providing rationale for the exceptional pore wall stability observed. The mesoporous silica spheres were synthesized from tetraethyl orthosilicate (TEOS) at room temperature and near-neutral pH using cysteamine and cetyltrimethylammonium bromide (CTAB) in a mixed water and ethanol system. Sphere size was shown to be tunable by altering the relative amounts of ethanol, CTAB, or TEOS. Sphere diameters ranging from 30 nm to 560 nm were observed. The preparation method and characterization of these highly condensed, thermally stable, mesoporous silica spheres for applications including sensing, catalysis, purification, and payload encapsulation is presented.

[1]AFOSR, MRSEC, NSEC

Christopher Ziegler
University of Massachusetts Amherst

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