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(54) Title: SILICEOUS MATERIALS HAVING TUNABLE POROSITY AND SURFACE MORPHOLOGY AND METHODS OF SYNTHESIZING SAME

(57) Abstract: Non-spherical siliceous particles having a plurality of porous branches are disclosed and claimed. The porous branches are randomly oriented and elongated, ring-like, and/or aggregated. An additive introduced during synthesis of the particles modifies pore volume and morphology. The tunability of the pore volume includes an inner diameter ranging from about 2 to about 50,000. Synthesizing the particles includes mixing under constant or intermittent stirring in a reaction vessel an aqueous silicic acid solution with an acidic heel solution to form a mixture. The stirring may optionally be performed at a variable speed. An additive is introduced into the mixture at a controlled rate, wherein the additive imposes a pH change from a lower pH to a higher pH to the mixture to induce siliceous particle precipitation. Optionally, a metal dopant may be introduced into the particles and/or at least a portion of an outer surface located outside of the pores and/or an inner surface located inside of the pores may be modified.



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