## Nanocomposites and nanomaterials

# Nano-particulate structures with glucose derived char and compacted fumed silica in gaseous and aqueous media

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Compacted fumed silica (densil, DS) was prepared using mechanochemical activation (MCA) of wetted nanosilica A-300 (0.5 g of water per gram of dry silica) in a powder state. Densil is characterized by a value of the specific surface area ($S_{BET}$ = 328 $m^2$/g) close to that of initial silica (330 $m^2$/g) but by a greater value of the pore volume (1.325 $cm^3$/g *vs.* 0.826 $cm^3$/g) and a greater bulk density (0.21 g/$cm^3$ *vs.* 0.05 g/$cm^3$). Despite these textural changes, densil remains in the powder state. Densil was used as a matrix for preparation of a composite with glucose (Gl/DS) (90 g of glucose + 25 g of water per 50 g of DS), which was then carbonized to form nano-particulate char bound to nanosilica. The Gl/DS composite has strongly reduced porosity (0.227 $cm^3$/g) and specific surface area (42 $m^2$/g) compared to DS. After carbonization of bound glucose (500 $^oC$ for 3 h), the values of pore volume (0.5 $cm^3$/g) and $S_{BET}$ (302 $m^2$/g) of increase, and contribution of nanopores significantly grows.

The particle size distribution of C/DS in the aqueous media is similar to that of DS (mainly in the range of 0.1-10 m) that is appropriate for some practical applications of both DS and C/DS, *e.g.* as drug carriers and enterosorbents.

The developed method of gas-phase mechano-sorption modification of nanooxides can be useful for adsorption modification of disperse materials by non-volatile compounds using a small amount of a solvent (~30-40 wt.% in a mixture).

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