Hollow carbon submicrospheres with porous shell: contolling the size

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Hollow carbon submicrospheres with porous shell were obtained by hard templating method. Silica templates were synthesized using TEOS as precursor and trimethoxi(octadecyl)silane (C18TMS) or trimethoxi(hexadecyl)silane (C16TMS) as porogenic agents in a two-step procedure: firstly, synthesis of the spherical non-porous nucleus, and secondly, formation of a double porous shell around the nucleus. The use of C16TMS during shell formation was an alternative with lower cost than C18TMS, although it led to the formation of secondary particles with a significant influence on particle size. The stirring speed and the feeding rate of reagents were the main variables influencing the synthesis of the template. The size of the spherical template increased from 525 to 890 nm when the stirring speed was increased within the low range (50-100 rpm). This effect was more pronounce when the porogenic agent was added at a higher rate. The increase of feeding rate of reagents (72- 212 µL/s) led to a lower values of the size of the template from 890 to 415 nm and also a higher prevalence of secondary nucleation was observed. The carbon submicrocapsules were successfully replicated from the silica templates by infiltration of a commercial resol resin diluted in ethanol, pyrolysis at 700ºC, and removal of the template by washing with HF. They showed BET surface areas of 1000-1100 m^2/g and a pore volumes of 0.95-1.0 cm^3/g.

- Se ha comprobado la reproducibilidad del molde para las condiciones de operación seleccionadas. Se han obtenido microcápsulas de carbón con tamaño medio de partícula de 654 nm y sin presencia de partículas secundarias. El material presenta un área BET de 1032 m^2/g, y un elevado volumen de mesoporo de 0,96 cm^3/g