ISGC 2019
May 13th - 17th

N°965 / PC
TOPIC(s) : Biomass conversion / Chemical engineering

Revealing the Dynamic Formation Process and Mechanism of Morphology-Controlled Hollow Structured Carbon Particles: From Bowl to Sphere

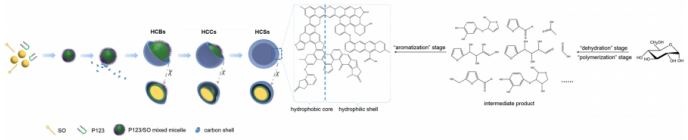
AUTHORS

Xin LIU / BEIJING FORESTRY UNIVERSITY, 35 QINGHUA EAST ROAD, HAIDIAN DISTRICT, BEIJING, BEIJING
Corresponding author : Xueming ZHANG / xm_zhang@bjfu.edu.cn

PURPOSE OF THE ABSTRACT

Hollow structured carbon particles (HCPs) are attracting great attention due to their unique properties. Herein, we chose glucose, a sustainable carbon-rich material, as the carbon precursor, and PEO?PPO?PEO triblock copolymers (P123) and sodium oleate (SO) as double surfactants to synthesize morphology-controlled HCPs (including hollow carbon bowls, capsules and spheres) in hydrothermal carbonization system by regulating the reaction time. The resultant particles were stable and uniform, and showed good performance in potential biochemistry and electrochemical applications. Additionally, this process is green, sustainable and easy operation. Remarkably, we proposed a dynamic formation mechanism of morphology-controlled HCPs based on the hydrothermal carbonization and soft templating as follows: During the hydrothermal process, the glucose undergone hydration, polymerization and aromatization stages to produce amphiphilic derivatives. Simultaneously, the double surfactant interacted with each other in the acidic environment to act as the soft template. With the reaction time prolonged, the nucleation took place, and the HCPs with different morphologies formed successively. We believed that this study will provide a valuable way to illustrate the hollow carbon particles' growth in the hydrothermal carbonization and soft templating synergistic reaction system.

FIGURES



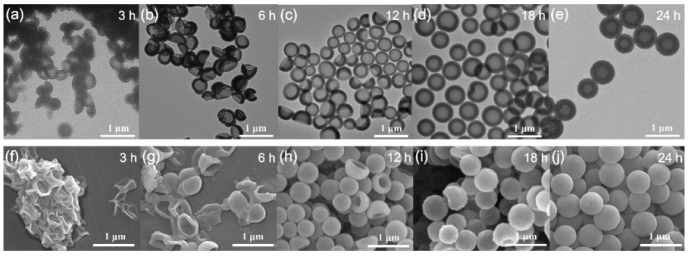


FIGURE 1

Schematic illustration of the formation process of HCSs.

Schematic illustration of the formation process of HCSs.

FIGURE 2

TEM and SEM images of the HCPs prepared with different reaction times.

TEM and SEM images of the HCPs prepared with different reaction times.

KEYWORDS

Glucose | Hydrothermal carbon | Hollow carbon spheres | Soft templating method

BIBLIOGRAPHY

[1] Liu X, et al. ACS Sustainable Chemistry & Engineering, 2018, 6(2): 2797-2805.