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Synthesis of Silica@C-dots/Phosphotungstates Core-Shell Microsphere for Effective Oxidative-Adsorptive Desulfurization of Dibenzothiophene with Less Oxidant

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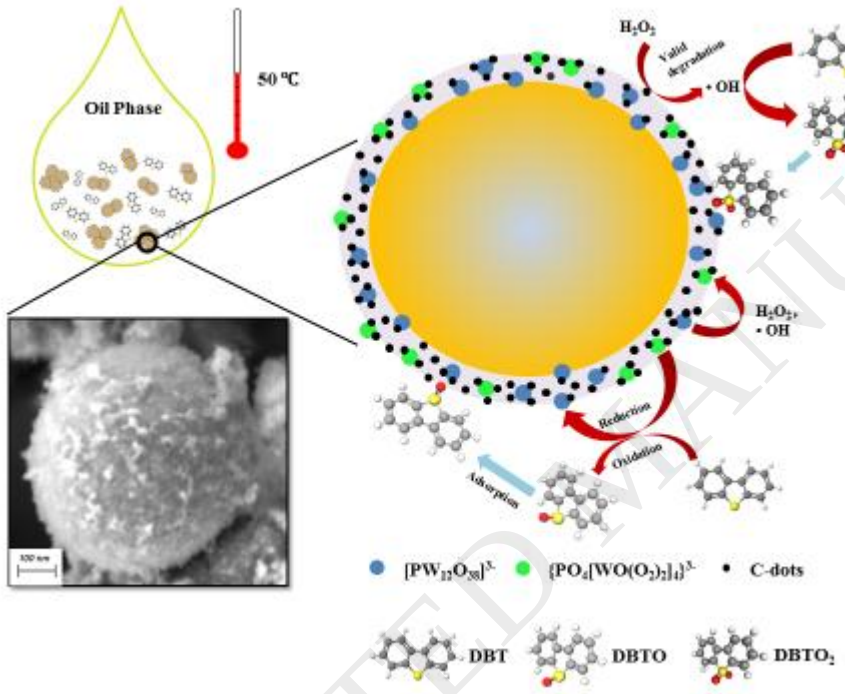
Graphical asbtract



Highlights:

- 1. A microsphere catalyst SiO_2@C-dots/PW5501 with core-shell structure was synthesized.
- 2. SiO_2@C-dots/PW5501 act as both catalyst and adsorbent in OADS system.
- 3. The catalytic activity of $[PW_{12}O_{40}]^{3-}$ was greatly enhanced by calcination treatment.
- 4. C-dots was proved to be an effective cocatalyst in this thermocatalytic reaction.
- 5. Desulfurization efficiency could reach 98.08% under a low $n(H_2O_2)/n(DBT)$ of 1.75.

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Abstract: A core-shell microsphere catalyst with a solid silica core and a mesoporous shell made up of quaternary ammonium phosphotungstate and carbon dots (C-dots) was successfully synthesized for the oxidative-adsorptive desulfurization (OADS) of dibenzothiophene (DBT) in fuel oil. The phosphotungstic acid used for the synthesis of the catalyst was calcined to enhance its activity. XRD, FT-IR and catalytic test showed that the defective Keggin anion $[PW_{12}O_{38}]^{3-}$ formed under proper calcination conditions could explain the