Introduction

TiO₂ can be used in many applications: (photo)catalysis, sensing, Li-ion insertion... Generally a high crystallinity degree, surface area and a control on pore size is needed for profoundly performing materials. We synthesized PDMA-b-PS block copolymers to assemble TiO₂ (nanoparticles) to mesoporous structures.

Sol - gel route

Solution
PDMA-b-PS is dissolved in THF, EtOH, HCl and Ti(IV) isopropanoxide are added.

Aggregation
Reflux 1h at 45 °C, 20h at 90 °C, 2d evaporation of solvents.

Amorphous TiO₂
2d reflux 0.1 M NaOH.

Crystalline TiO₂
2h at 450 °C, 2°C/min ramp.

Table:

<table>
<thead>
<tr>
<th>Block copolymer</th>
<th>PDMA [μg]</th>
<th>PS [μg]</th>
<th>ID</th>
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Nanocrystal route

Nanocrystal (NC) synthesis
TiCl₄, toluene, 1-BuOH are heated 2x [90°C (1min) – 50°C (20min)] in microwave.

Suspension
NP’s in EtOH are added to PDMA-b-PS solution in THF.

Aggregation
3d evaporation of solvents.

Crystalline TiO₂
2h at 400 °C, 2°C/min ramp.

Application

Photo catalysis: degradation Isoproturon
With TiO₂ (PDMA₅₇₆-b-PS₅₇₆), sol-gel method, 60 % anatase, 240 m²/g.

Conclusion

By using self-synthesized PDMA-b-PS we were able to make mesoporous and crystalline TiO₂ with:

- Control on pore size: 7 – 40 nm
- Surface area: 3₂₅₋₋ 240 – 310 m²/g
- Crystallinity degree: 40 – 85 % anatase

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