Preparation and hybridization of titania particles to control the photocatalytic reactions

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Hybridization of functional particles with other components have been examined for several objectives including catalysts' design.[1,2] For the materials design, the immobilization of titania particles with solid supports such as clays and porous alumina membrane have been reported.[1-3] TO suppress the photocatalytic activity, coating of titania particle with silica has been examined.[4]

The preparation of well-defined semiconductor nanoparticles using mesoporous silicas as template has been reported.[5,6] The preparation is based on the infiltration of molecular precursor into the pore and the subsequent crystallization in the pore. Anatase nanoparticles (single nanorod and connected nanorods) with the diameter similar to the pore size of the template (cylindrical mesopore of SBA-15 with the pore diameter of 8 nm) were prepared by the infiltration of the partially hydrolyzed titanium alkoxide and the subsequent in-situ crystallization in the mesopore by the calcination.[5] Rutile nanoparticles were obtained by the infiltration of the partially hydrolyzed titanium alkoxide and the subsequent in-situ crystallization by the reaction with HCl vapor at room temperature.[6]

References

[1] Wijitwongwan, R. P., et al., *Dalton Trans.*, 2024, **53**, 6144.
[2] Ruiz-Hitzky, E., et al., *Beilstein J. Nanotech.*, 2019, **10**, 1140
[3] Deepracha, S., et al., *Applied Clay Sci.,* 2019, **169,** 129. Deepracha, S., et al., *Appl. Catal. B: Environ.*, 2021, 119705., Deepracha, S., et al., *Separation Purification Tech.,* 2021*,* **262**, 118307.
[4] Cheepborisutikul, S.J. Ogawa M. *Inorg. Chem.*, 2021, **60**, 6201. ibid., 2023, **62**, 12166.
[5] Vibulyaseak, et al., *ACS Applied Nano Mater.,* 2023, **5***,* 18004 (2023).
[6] Vibulyaseak, K.G., et al., *Inorg. Chem.* 2020, **59**, 7934. Paengjun, N.K., et al., *Sci. Rep.* 2021, **11**, 1.

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