The optical properties of Dopamine-TiO$_2$ submicronic sized particles

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ABSTRACT

This work focuses on studying the formation of charge transfer complex, between TiO$_2$ surface and dopamine, that induced significant red-shift of optical absorption in comparison to unmodified TiO$_2$ particles. The submicron sized dopamine modified TiO$_2$ particles were obtained by means of low temperature aerosol synthesis using two different precursor solutions: unmodified colloidal TiO$_2$ and the surface modified colloidal TiO$_2$ solution with dopamine. The obtained particles from first one were additionally modified by dopamine after completing the synthesis procedure. Transmission and Scanning Electron Microscopy show that particles obtained through both procedures have diameter of approximately 440 nm and contain small primary building units. Their surface structure and optical properties were analyzed using Fourier Transform Infrared and UV-Vis spectroscopy investigations.

CONCLUSION

In conclusion, we proposed two different procedures for the synthesis of submicron-sized DA-TiO$_2$ aggregates for visible light absorption. Both of them are simple, reproducible and easy for scaling-up. Obtained aggregates have bi-functional properties: large surface area due to the nano-substructure and size comparable to the wave length of visible light, which is essential for effective light scattering. This novel nano-structured material might be a promising candidate for further optimization of working electrode morphology and DSCs overall efficiency.

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