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Hybridization of a Zn-smectite with spherical silica particles

Spherical plastic beads have been used in cosmetics to scatter light and blur skin imperfections, however non-biodegradability concerns marine pollution. As an alternative, this study explores the use of naturally abundant silica. A white cosmetic pigment has been developed by directly growing layered Zn-substituted hectorite on spherical silica particle to enhance light multiple scattering, and to mimic optical properties of a white beetle comprising anisotropic fibrous chitin[1)].

The synthesis involved using porous (FB-82) and non-porous (KE-P250) silica supports with the size of a few micrometers. After silica powder was mixed into an aqueous LiF, $ZnCl_2$, and urea solution in controlled molar ratios, the mixture was treated at 80°C for 48 h, followed by washing and subsequent drying.

Diffraction peaks in the XRD pattern were characteristic of hectorite in all samples. When non-porous silica was used, Zn(OH)F coprecipitated due to insufficient dissolved silica during the heat treatment in the aqueous alkaline media. In contrast, porous silica provided Zn-hectorite without formation of Zn(OH)F. SEM images revealed hemispherical aggregates (0.1–0.2 μm) on the porous silica, which were composed of plate-shaped particles. The size of the particulate plates became larger when the non-porous silica was used, indicating that specific surface area of silica determines the final crystalline size and its aggregate.

1) Burresi, M., et al., *Sci. Rep.*, **4**, 6075 (2014).