Biomimetic Mineralization of Calcium Carbonate Crystals Adjusted by Osmanthus Leaves

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Calcium carbonate mineral has formed on both the surface and the subsurface of Earth throughout its history. These minerals, both biogenic and abiogenic, have been studied by numerous researchers not only because of their ubiquity in or on Earth, but also because of their special importance as a mineralized tissue in the natural nacre of conch and pearls. However, until now there is no agreement about biomineralization mechanism of $CaCO_3$. Here, the nervation of the crude Osmanthus leaves was used to induce and control the crystal nucleation and growth of $CaCO_3$. The results show that the morphology of $CaCO_3$ changed from polymorph to unitary cubic structure while the crystalline phase transformed from pure vaterite to mixture of vaterite and calcite with the increase of the concentration of Ca^{2+}. Diffusion rate of CO_2 also has an important effect on the morphology of the product. Increasing diffusion rate of CO_2 will not avail to the growth of vaterite parallel to the (200) plane. The kinetic investigation of $CaCO_3$ formation indicates the conversion of $CaCO_3$ from vaterite to calcite with the time increase. Also, porous calcium carbonate was obtained on the nervation at low concentration of Ca^{2+}. In comparison to previous reports, this study develops a green strategy for fabricating $CaCO_3$ crystals.

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