

Biomimetic 1-aminocyclopropane-1-carboxylic acid oxidase ethylene production by MIL-100(Fe)-based materials.

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Streszczenie

A novel core@shell hybrid material based on biocompatible hydroxyapatite nanoparticles (HA) and the well-known MIL-100(Fe) ($\text{Fe}_3\text{O}(\text{H}_2\text{O})_2\text{F}(\text{BTC})_2 \cdot n\text{H}_2\text{O}$, BTC: 1,3,5-benzenetricarboxylate) has been prepared following a layer-by-layer strategy. The core@shell nature of the studied system has been confirmed by infrared, X-ray powder diffraction, N_2 adsorption, transmission electron microscopy imaging, and EDS analyses revealing the homogeneous deposition of MIL-100(Fe) on HA, leading to HA@MIL-100(Fe) rod-shaped nanoparticles with a 7 nm shell thickness. Moreover, both MIL-100(Fe) and HA@MIL-100(Fe) have demonstrated to act as efficient heterogeneous catalysts toward the biomimetic oxidation of 1-aminocyclopropane-1-carboxylic acid into ethylene gas, a stimulator that regulates fruit ripening. Indeed, the hybrid material maintains the catalytic properties of pristine MIL-100(Fe) reaching 40% of conversion after only 20 min. Finally, the chemical stability of the catalyst in water has also been monitored for 21 days by inductively coupled plasma-mass spectrometry confirming that only ca. 3% of Ca is leached.

Słowa kluczowe

metal organic frameworks, hydroxyapatite, Hybrid material, catalysis, agriculture

Adres publiczny

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