

Self-Assembled Monolayer of Artificial Siderophores

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Siderophores, which are secreted by microorganism for iron uptake, are one of the most important bio-related materials. We have studied on construction of artificial siderophores, as functional models for natural siderophores. Our aim is the development of biomaterial devices using the artificial siderophores. In this study, we prepared artificial siderophore-modified substrate and demonstrated immobilization of microorganism onto these substrates.

The artificial siderophore including the binding site for the substrate were newly synthesized by modification of previous method. The culture experiments of microorganism clearly indicated that these artificial siderophores were able to transport iron. These artificial siderophores were modified onto the substrate surface by the self-assembling method. The incubation experiments of bacteria on the surface of these artificial siderophore-modified substrate indicated that bacteria were attached onto these substrate surfaces. Fig.1 and Fig.2 show the optical and scanning-electron microscopic images of substrate surfaces after incubation, respectively. No bacteria were observed on the surface without artificial siderophore units (Fig.1(a)), whereas bacteria were observed at the surface of artificial siderophore-modified substrate (Fig.1(b)), whose immobilization was also confirmed from the SEM image. These results indicate the existence of the interaction between microorganisms and artificial siderophore units. This interaction should appear by the permeation of the artificial siderophore units to the bacterial cell.

We succeeded in the immobilization of microorganisms by the artificial siderophore-modified substrates. This method should be a powerful tool for binder, sensor and probe of various microorganisms.

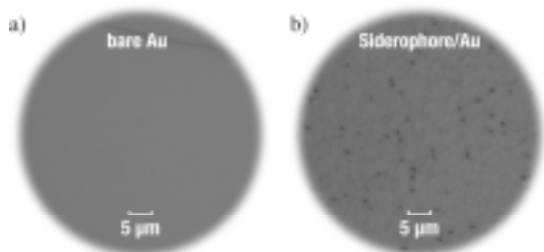


Fig. 1 The optical microscopic images of the surfaces of (a) bare Au and (b) siderophore/Au substrate.

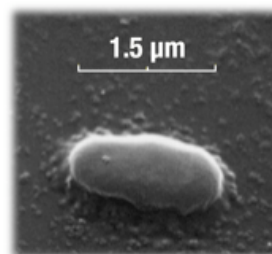


Fig. 2 The SEM image of bacteria immobilized on siderophore/Au substrate.