Arrangement of Biological Molecules Using Highly Ordered Nanohole Array of Anodic Porous Alumina

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Introduction

Arrangement of functional biological substances has attracted considerable interest because the applications to useful tools for making estimates of particular messages from living body and the molecular electronics are expected. The fabrications of biological array with various substances and substrates have been conducted vigorously both recently and in the past by many researchers. In this study, we examined the arrangement of biological substances on an Au nanodisk array fabricated by porous alumina having highly ordered nanohole[1, 2)]. Employment of uniformly shaped and highly ordered Au nanodisks is considered to bring about the advance of arrangement of biological molecules at molecular revel.

Experimental

Anodic porous alumina was prepared as reported previously [3)]. An Au nanodisk array was prepared with the porous alumina. After anodization of aluminum, an Au metal was deposited in the holes of the porous alumina in AC electrolysis with a commercially available Au plating solution. Finally, argon etching of the surface side of the porous alumina packed with Au metal was carried out in argon etching apparatus in order to flatten the surface of Au disk array. Various biological substances were adsorbed on Au disk array from aqueous solution containing biological substances by dropping the solutions on the array.

Results and discussion

We examined the arrangement of ferritin on Au nanodisk array. It has been reported that ferritin has a diameter of 15 nm with a core of high electron density, composed of Fe_2O_3. SEM observation showed the image of ferritin molecules ordered on the Au nanodisks selectively. Aggregation of ferritin molecules did not occur on the Au disk. Moreover, the adsorbed ferritin did not desorb from the Au disk even by soaking in aqueous solution. Adsorption of ferritin on the Au nanodisk was irreversible. The preparation of the biological array using highly ordered nanohole of porous alumina will conduct to the development of the biological molecules arrays which are applied to several fields that need highly ordered structure, such as those involving sensors, actuator and so on.

References

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