Localized Electrochemical Deposition Process Improvement and Fabrication of Three-Dimensional Structure

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ABSTRACT

In general, electrochemical deposition has been employed to deposit metal on the metallic surface (plating) or to deposit metal for duplicating the patterns prepared by photolithographic process (electroforming). However, by locally controlling the induced electric field to selectively deposit metal, the lithography process for prepare the pattern by masks can be spared. Thus, it can reduce fabrication cost and error of masks or molds. Furthermore, using a localized electrochemical deposition can produce micro-sized structures with high aspect ratio easily. Usually, the structure which is fabricated by micro-process, demonstrates mechanical properties different from its bulk material counterparts. In this study, we improve the localized electrochemical deposition by employing horizontally aligned anode to fabricate a cantilever beam of Cu which is in the dimensions of micrometers. The effects of various control parameters of the deposition process are also studied. The fundamental resonance frequency of the cantilever structure is measured and the apparent density, thereby the porosity, of deposited structure is quantified. In addition, we control the movement of the X-Y axes step motor platform and Z axis step motor to deposit two-dimensional and three-dimensional micro-structures. With the successfully manufactured two-dimensional and the three dimensional microstructures, further study on their physical characteristics in the future can be recommended.

Keywords : localized electrochemical deposition ; cantilever structure ; future ; horizontal deposition

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