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Abstract
This study consists of two parts. The first part is to investigate four kinds of commonly used etching liquids to etch the thin film of indium tin oxide (ITO), and then compares the differences among them. When the ITO film is etched, the photo resistant layer usually serves as an etching mask to etch the required pattern. Therefore, it is necessary to find out the fastest way to etch the ITO film but almost not to etch the photo resistant layer. This study not only compares the etching rate of ITO film by four kinds of etching liquids at different temperatures and concentrations, but also measures the roughness of etched surface by an atomic force microscopy (AFM). Four kinds of etching liquids used in this study are HCl, HCl+H2O2, HCl+FeCl3 and (COOH)2·2H2O+H2O. Experimental results show that the four kinds of etching liquids have a faster etching rate at about 80 °C and the highest concentration; their averages are 600, 450, 900, 37.5 nm/min, respectively. All etching liquids with lowest concentration lead to better surface roughness. The etching liquids HCl+H2O and HCl+H2O2 have better surface roughness of 0.4 nm and 0.6 nm, respectively, at 50° C; while (COOH)2·2H2O+H2O and FeCl3+HCl have better surface roughness of 0.03 nm and 0.5 nm at 80°C. The results of this study could be applied to the surface treatment of biochips that commonly use the ITO film as an electrode and to the combination of PDMS and ITO film glass. The second part of this study is to investigate metals as electrodes or conducting layers which are common used in the processes of micro-electro-mechanic-system (MEMS). Since the common used gold (Au) is difficult to affix on glass while evaporating, it needs a sticking layer to make gold adhere on glass. Therefore, common used metal chromium (Cr) is selected as sticking layers in this study. Evaporating rate, chamber temperature, and chamber vacuum are chosen as factors and an orthogonal array L9 with three levels is designed by Taguchi method. The changes of thin film characteristics and the quality of evaporated gold are examined by varying the parameters. Experimental results show that the condition of evaporating rate 0.5 U+C5/s, chamber temperature 21°C, and chamber vacuum 4.0?-7 torr has better quality of thin film.
Keywords: etching of ITO film, etching rate, roughness of etched surface, e-beam, evaporation, sticking layer, Taguchi method
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