MICROFABRICATED STRUCTURES FOR IMAGING HIGHLY MOTILE NON-ADHERENT CELLS

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1. INTRODUCTION

Significant progress in the understanding of molecular activities underlying cellular processes, such as migration [1] and cell-cell communication [2] have been enabled through the development of improved imaging technologies and fluorescence labelling techniques. However, prolonged high resolution live cell imaging of highly motile non-adherent cells is still a challenge as some types of cells have been shown to migrate at speeds of up to 25 \(\mu\)m/min [3]. We report here on the fabrication and demonstration of micrometre sized grid structures to isolate and confine small quantities of cells within a field of view for prolonged imaging. The microgrids enable the in-vitro imaging of cells in a more physiologically relevant context than has previously been achieved.

2. EXPERIMENTAL

Microgrids are produced by femtosecond laser etching a mold then replicating the microstructures in poly(dimethylsiloxane) (PDMS). The use of the femtosecond laser allows a variety of materials to be machined for the mold, ranging from polymers to glass and metals. The amplified femtosecond pulse laser directly ionizes the substrate material allowing for direct laser writing of three-dimensional microstructures with little damage to the surrounding material. In these experiments microgrid arrays with individual microgrid sizes ranging from 30 \(\mu\)m to 250 \(\mu\)m and depths ranging from 20 \(\mu\)m to 60 \(\mu\)m were fabricated.

Figure 1: Microgrids in PDMS. (a) 80 \(\mu\)m and (b) 250 \(\mu\)m square grids.

3. REFERENCES