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Photosensitive Anti-Biofouling Polycarboxymethylbetaine Coating: Polymerization, Photolithography, and Cell Aggregation along the Pattern Geometry

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ABSTRACT

Polycaboxymethylbetaine (PCMB) having a carboxymethylbetaine (CMB) and epoxy structure on its side chains was synthesized. The photosensitive anti-biofouling coating was formulated by loading the PCMB with a photo acid generator (PAG). By applying i-line irradiation and subsequent baking to this coating film, the processed area of the former film became insoluble to water, and thus, photolithographic polymer micropatterns with various dimensions were created on the substrates. As an initial assessment for targeted three-dimensional (3D) culture, HT-29 human colon cancer cells and UE7T-13 human mesenchymal stem cells (hMSCs) were disseminated on the patterns, and then cultured. Results showed that both cells selectively aggregated within the patterns. The cell aggregates prepared here may be promising candidates for use in regenerative medicine and/or drag screening.

Keywords: biomaterials coatings, copolymerization, biological applications of polymers, biocompatibility

Abbreviations: **CMB**, carboxymethylbetaine; **PCMB**, polycarboxymethylbetaine; **hMSCs**, human mesenchymal stem cells; **PAG**, photo acid generator; **GMA**, glycidyl methacrylate; **BzMA**, benzyl methacrylate; **EL**, ethyl lactate; **PEB**, post-exposure bake

1. INTRODUCTION

There has been increasing interest in 3D culture due to the development of a microfabricated platform amenable to high-throughput screening (HTS) and advances in cell culture. Recently, peristaltic gut organoids from human pluripotent stem cells have been successfully generated on a patterning substrate.[1] The author pointed out that the peristaltic gut organoids could be a platform for studying human intestinal diseases and for pharmacological testing.

It is common to culture adherent cells two-dimensionally (2D) on a flat substrate like cell culture treated polystyrenes or ones coated with a cell adhesive material such as laminine (LN), fibronectin (FN)