

Two dimensional anisotropic etching in tracked glass

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Journal of Materials Chemistry 19 (2009) 8142-8149

We describe in this paper the creation of a two-dimensional pore gradient using hydrofluoric acid (HF) chemical etching of tracked glasses (TGs). The first gradient was along the plane of TGs where the pore diameters of the conical pores were modulated, and a second gradient was formed in pores along the axis of each pore. The 2-D pore gradient in TGs was characterized with optical and electron microscopies. We demonstrate that the pore gradient was formed only when the TGs had a thin layer of polydimethylsiloxane (PDMS) on their surface and when the etching solution was not stirred. The 2-D pore gradient was also found to be dependent upon the TG orientation with respect to the etching solution. Following the reaction between HF and PDMS, the resulting insoluble precipitate was deposited, due to gravity, at the bottom of the vertical TG's etching surface, accruing at the mouths of the pores. This precipitate deposition at pore mouths appeared to hinder the diffusion of HF to the pore surface. This build up also caused the retention of the by-products inside the pores which further suppressed the etching of the glass. The etching process was inhibited more at the bottom of the chips than that at the top presumably due to the formation of a precipitate gradient on TG surface. Using a 2-D pore gradient containing TGs, many different experiments can be performed simultaneously which will improve the throughput rate and aid analysis in many potential applications in materials and life sciences.