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MeV ion beam mask lithography of parylene-C and parylene-F

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Lithographic patterning with 16O^+ ions has been demonstrated by us, and others in polytetrafluoroethylene (PTFE). Motivated by the molecular level similarity of PTFE with parylene-C and parylene-F; we have investigated the possibility of using 0.6–2 MeV oxygen ions to pattern these polymers using aperture mask lithography for prosthetic applications in inner-ear surgery.

Parylene-C and -F could be patterned in a similar way to that reported for PTFE. However, the removal per unit fluence for 1 MeV 16O^+ was ~5% that for PTFE. Both films deposited on glass and silicon substrates and self-supporting films of Parylene-C could be patterned. We also investigated irradiation in a atmosphere of up to 10^{-3} mbar oxygen and observed any increase in removal rate for the polymers in question. Increasing the energy of the 16O^+ beam from 600 keV to 2 MeV increased the removal rate of parylene-C ~1.5 \times .

Biocompatibility tests using murin Spiral Ganglia cells (SG) showed that there was no significant difference in SG cell proliferation between irradiated and unirradiated areas. Moreover, laminin and poly-L-lysine applied after ion irradiation completely dominate the cell attachment.

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