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**Vertical electric field stimulation of neural cells on porous amorphous carbon electrodes** SHILPEE JAIN, ASHUTOSH SHARMA, Indian Inst of Tech-Kanpur, BIKRAMJIT BASU, Indian Institute of Science, Bangalore — We demonstrate the efficacy of amorphous macroporous carbon substrates as electrodes to stimulate neuronal cell proliferation in presence of external electric field. The electric field was applied perpendicular to carbon electrode, while growing mouse neuroblastoma (N2a) cells *in vitro*. The placement of the second electrode outside of the cell culture medium allows the investigation of cell response to electric field without the concurrent complexities of submerged electrodes such as potentially toxic electrode reactions, electro-kinetic flows and charge transfer (electrical current) in the cell medium. The macroporous carbon electrodes are uniquely characterized by a higher specific charge storage capacity ( $0.2 \text{ mC/cm}^2$ ) and low impedance ( $3.3 \text{ k}\Omega$  at  $1 \text{ kHz}$ ). When a uniform or a gradient electric field was applied perpendicular to the amorphous carbon substrate, it was found that the N2a cell viability and neurite length were higher at low electric field strengths ( $\leq 2.5 \text{ V/cm}$ ) compared to that measured without an applied field ( $0 \text{ V/cm}$ ). Overall, the results of the present study unambiguously establish the uniform/gradient vertical electric field based culture protocol to stimulate neurite outgrowth and viability of nerve cells.

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