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High Surface Area Dendrite Nanoelectrodes for Electrochemistry[1] NATHAN NESBITT, JENNIFER GLOVER, SAURABH GOYAL, SVETOSLAV SIMIDJIYSKY, MICHAEL NAUGHTON, Boston College — Solution-based electrodeposition of metal using a low ion concentration, surface passivation agents, and/or electrochemical crystal conditioning has allowed for the formation of high surface area metal electrodes, useful for Raman spectroscopy and electrochemical sensors. Additionally, high frequency electrical oscillations have been used to electrically connect co-planar electrodes, a process called directed electrochemical nanowire assembly (DENA). These approaches aim to control the crystal face that metal atoms in solution will nucleate onto, thus causing anisotropic growth of metal crystals. However, DENA has not been used to create high surface area electrodes, and no study has been conducted on the effect of micron-scale surface topography on the initial nucleation of metal crystals on the electrode surface. When DENA is used to create a high surface area electrode, such a texture has a strong impact on the subsequent topography of the three dimensional dendritic structures by limiting the areal density of crystals on the electrode surface. Such structures both demonstrate unique physics concerning the nucleation of metal dendrites, and offer a unique and highly facile fabrication method of high surface area electrodes, useful for chemical and biological sensing.

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