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Fabrication and Characterization of a Nanocoax-Based Electrochemical Sensor[1] BINOD RIZAL, MICHELLE M. ARCHIBALD, JEFFREY R. NAUGHTON, TIMOTHY CONNOLLY, STEPHEN C. SHEPARD, MICHAEL J. BURNS, THOMAS C. CHILES, MICHAEL J. NAUGHTON, Boston College
— We used an imprint lithography process to fabricate three dimensional electrochemical sensors comprising arrays of vertically-oriented coaxial electrodes, with the coax cores and shields serving as working and counter electrodes, respectively, and with nanoscale separation gaps.[2] Arrays of devices with different electrode gaps (coax annuli) were prepared, yielding increasing sensitivity with decreasing annulus thickness. A coax-based sensor with a 100 nm annulus was found to have sensitivity 100 times greater than that of a conventional planar sensor control, which had millimeter-scale electrode gap spacing. We suggest that this enhancement is due to an increase in the diffusion of molecules between electrodes, which improves the current per unit surface area compared to the planar device.

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[2]B. Rizal, M. M. Archibald, T. Connolly, S. Shepard, M. J. Burns, T. C. Chiles, and M. J. Naughton, Anal.Chem. 85, 10040 (2013).

Binod Rizal
Boston College

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