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Fabrication of High-Aspect-Ratio Nanogaps ALEXANDRA FURSINA, Department of Chemistry, Rice University, 6100 Main St., Houston, TX 77005, SUNGBAE LEE, Department of Physics and Astronomy, Rice University, 6100 Main St., Houston, TX 77005, DOUGLAS NATELSON, Department of Physics and Astronomy, Department of Electrical and Computer Engineering, Rice University, 6100 Main St., Houston, TX 77005 — For nanoscale electrical characterization and device fabrication it is often desirable to fabricate planar metal electrodes with separations well below 100 nm running parallel over a macroscopic width. In this work we demonstrate a self-aligned process to accomplish this goal using a thin Cr film as a sacrificial etch layer. The resulting gaps can be as small as 10 nm and have aspect ratios exceeding 1000, with excellent interelectrode isolation. Two separate lithographic patterning steps are used to define first and second electrodes while the interelectrode separation is controlled by the oxidation of a Cr layer deposited upon the first electrode. Advantageously, only a μm-alignment of first and second electrodes is required and the described method effectively does not have limitations on the gap width while the length of the gap is controlled by the Cr layer thickness. In addition to fabrication of Ti/Au electrodes on Si substrates, our technique was also demonstrated to work for other electrode metals (Pt, Fe, etc.) even on such relatively reactive substrates as magnetite, F_3O_4, films, thus demonstrating the flexibility and utility of this method.

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