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Near field emission scanning electron microscopy TARYL KIRK, LORENZO DE PIETRO, OLIVIER SCHOLDER, THOMAS BAEHLER, URS RAMSPERGER, DANILO PESCIA, Swiss Federal Institute of Technology Zurich (ETHZ) — We present a simple "near field emission scanning electron microscope" (NFESEM) capable of imaging conducting surfaces with high spatial resolution. In this instrument electrons are excited from the sample surface after undergoing interactions with a low-voltage (< 60V) primary beam of electrons field-emitted from a Tungsten tip positioned tens of nanometers above the sample. Topographic images, determined from the intensity variations of secondary and backscattered electrons, yield a vertical resolution on an atomic scale and a lateral resolution of less than two nanometers. We report on the first topographic electron intensity images of terraces and mono-atomic steps on a single crystal substrate, not yet attained with a remote electron gun in conventional scanning electron microscopy. The topographic contrast of the extracted electrons and the field emission (FE) current are indistinguishable, in agreement with theoretical models of optimal spatial resolution. We assert that additional analysis of the secondary electrons will also exhibit a comparable resolution.

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