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Efficient combination of surface texturing and functional coating for very low secondary electron yield surfaces and rough non-evaporable getter films

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The formation of a fissured copper surface by picosecond pulsed laser irradiation is combined with functional coatings consisting of Ti and amorphous carbon layers or a Ti–Zr–V compound film to fabricate surfaces with the maximum of the secondary electron yield being as low as 0.4. By structural and spectroscopic analysis of the formed surfaces we demonstrate that both coatings enclose the nanostructures generated by redeposition of metal structures from the laser-induced plasma plume, keeping the initial topography intact. This allows an efficient elimination of secondary electron emission by combining the benefits from structural surface modification and adaption of electronic surface properties to efficiently dissipate the energy of impinging electrons. Thermal activation tests of the Ti–Zr–V non-evaporable getter films revealed that for films on nanostructured substrates, which have a much higher effective surface, a slight diminution of surface activation occurs at 160 and 200°C, while this effect is almost completely compensated when heating up to 250°C indicating promising pumping capabilities. Both examples highlight the benefits from combining 3-dimensional substrate patterning with classical 2-dimensional deposition technologies.

Supplementary Information I.

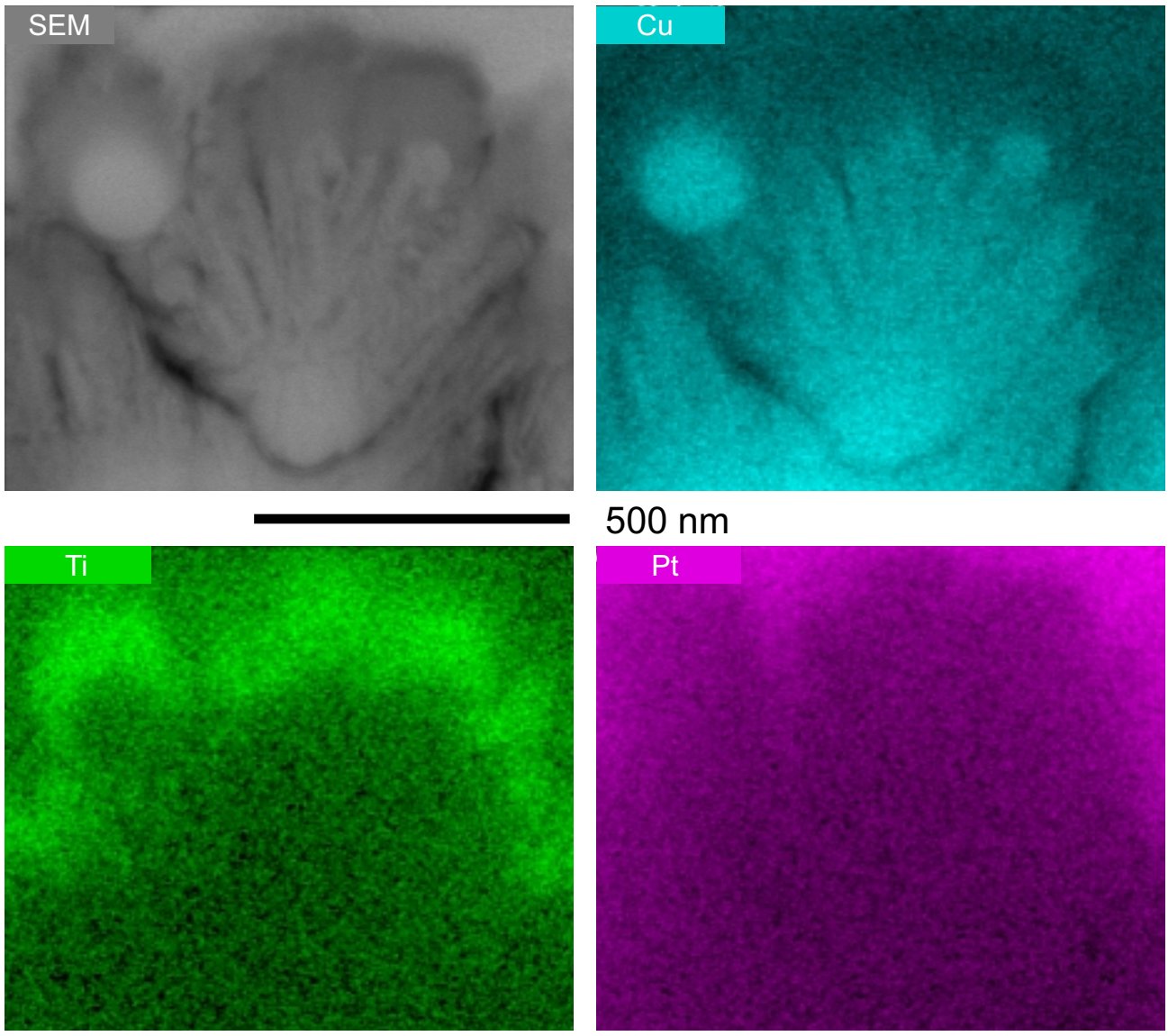

FIG. S1. EDX maps of the cross-section of an a-C/Ti coating on laser-treated Cu.

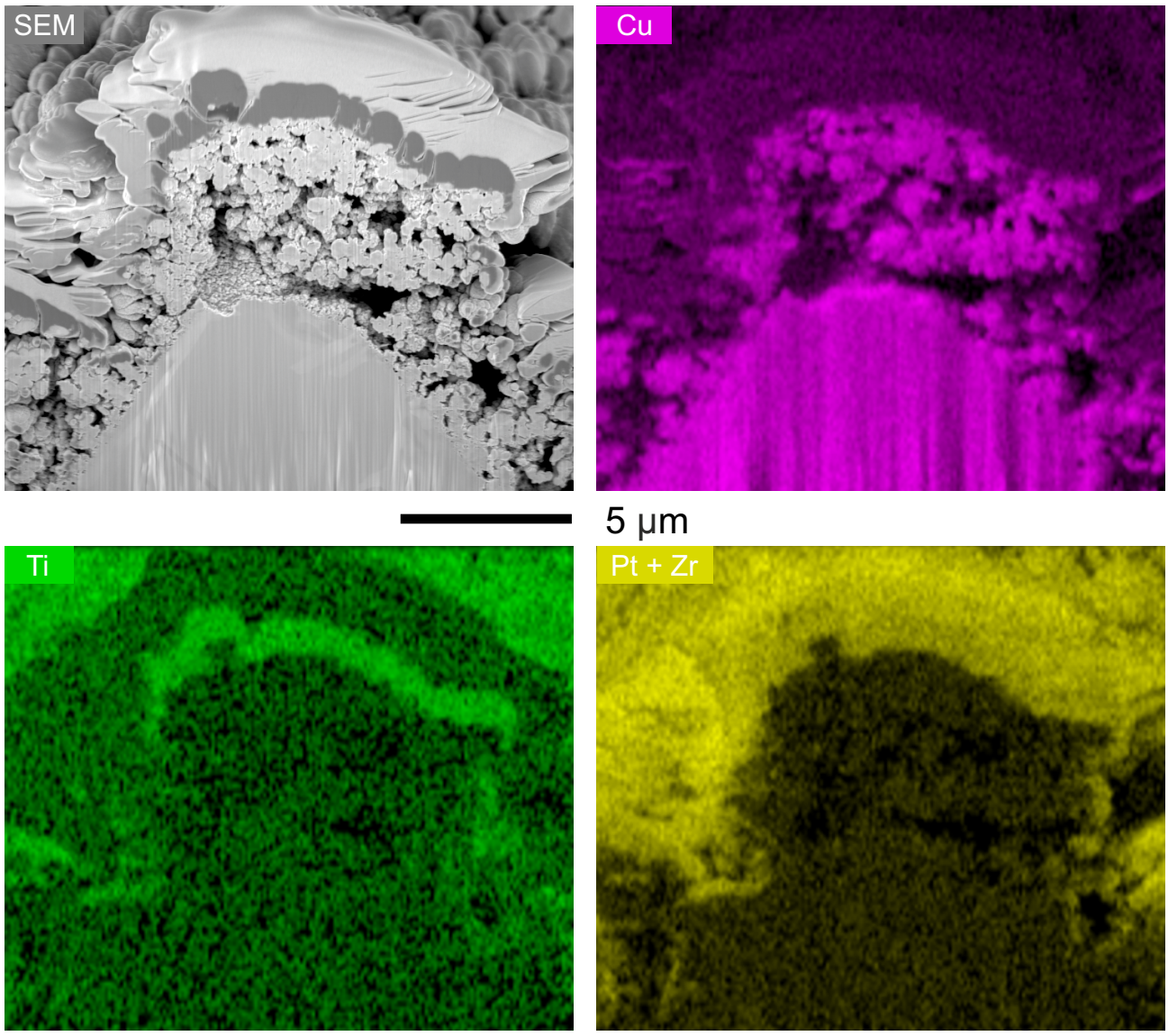

FIG. S2. EDX maps of the cross-section of a Ti–Zr–V NEG coating on laser-treated Cu.