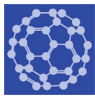 nanomaterials

MDPI

Supporting Information

Vanadium and Manganese Carbonyls as Precursors in Electron-Induced and Thermal Deposition Processes

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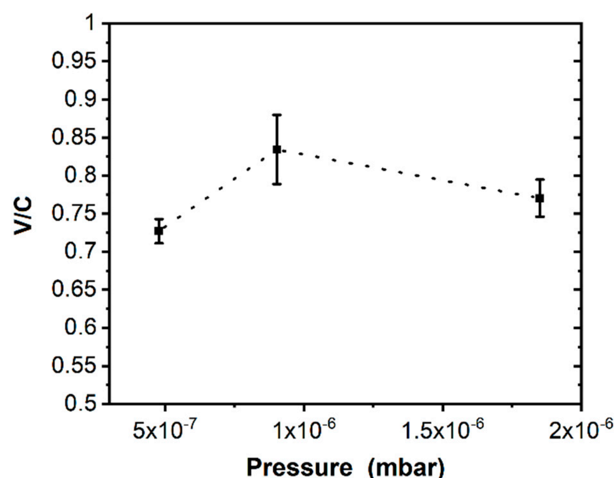

Figure S1. Evaluation of variation in V/C ratio using $V(CO)_6$ precursor in FEBID upon changing the precursor pressure. The deposit composition is determined by EDX (11 kV). FEBID parameters include 5 kV acceleration voltage, 1.6 nA beam current, deposition area of 1.4 µm x 1.4 µm, 20 nm x 20 nm pitch, 1 µs dwell-time. The deposition is carried out on Au (250 nm) / Cr (8 nm) / sapphire substrates.

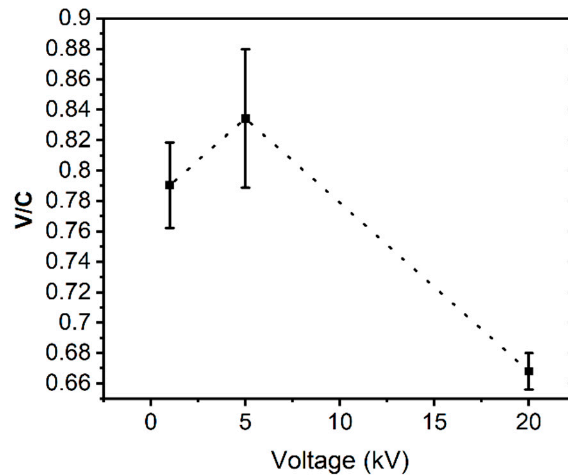

Figure S2. Evaluation of variation in V/C ratio upon changes in the acceleration voltage for FEBID using $V(CO)_6$ precursor when the acceleration voltage for FEBID deposition is varied. The deposit composition is determined by EDX (11 kV). FEBID parameters include deposition area 1.4 µm x 1.4 µm, 20 nm x 20 nm pitch, 1 µs dwell-time. The deposition is carried out on Au (250 nm) / Cr (8 nm) / sapphire substrates.

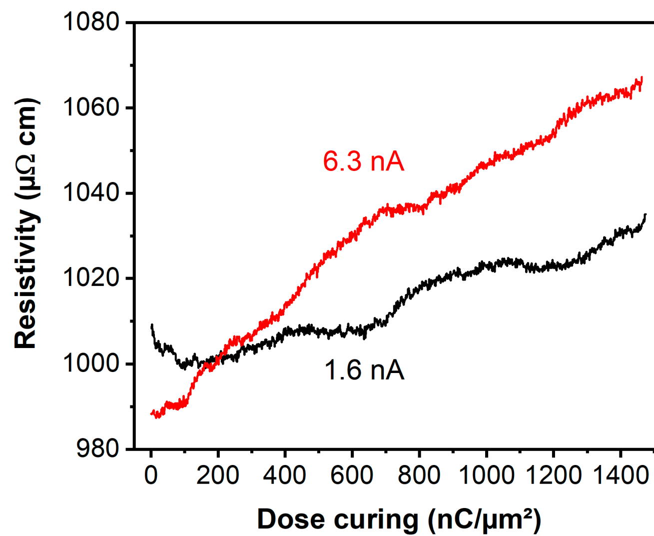

Figure S3. Changes in resistivity vs. electron dose for different deposition currents and variation in post-growth irradiation currents measured on of V-based FEBID material in two-probe configuration. Effect of dose on the materials resistivity is recorded *in situ* and illustrates only very minor variation with the electron beam current used for the curing.

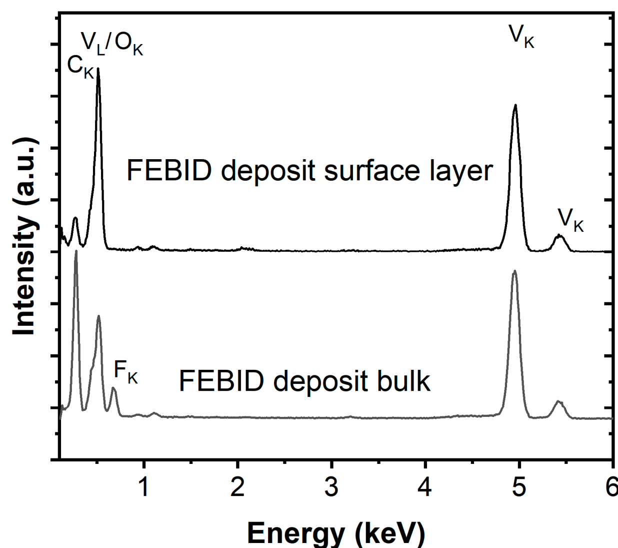

Figure S4. Comparison of TEM-EDX spectra of the FEBID deposit bulk and interface between the $VC_{1-x}O_x$ "bulk deposit" and the PtC_x protection layer deposited for TEM lamella preparation.

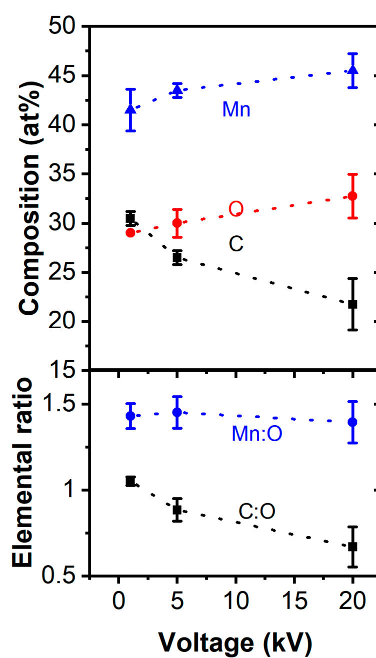

Figure S5. Evaluation of compositional variation of material derived by FEBID using $Mn_2(CO)_{10}$ precursor when the acceleration voltage for FEBID deposition is varied. The deposit composition is determined by EDX (3.5 kV). FEBID parameters include deposition area 1.4 µm x 1.4 µm, 20 nm x 20 nm pitch, 1 µs dwell-time. The deposition is carried out on Au (100 nm) / Cr (8 nm) / sapphire substrates.

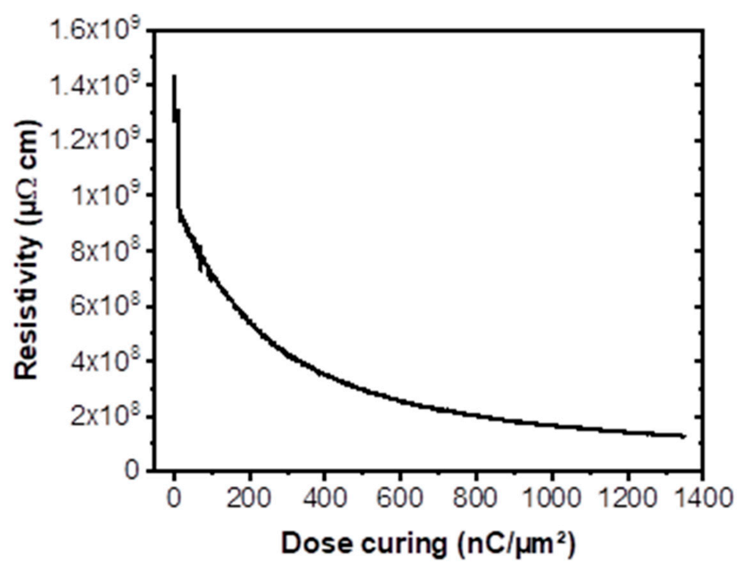

Figure S6. Changes in resistivity vs. electron dose for a Mn-based FEBID deposit in two-probe configuration. FEBID parameters include 5 kV acceleration voltage, 6.3 nA current, 20 nm x 20 nm pitch, 1 μs dwell-time. The effect of post-growth irradiation dose on the materials resistivity is recorded *in situ* and illustrates a decrease by ~one order of magnitude.