Electronic Supplementary Material (ESI) for CrystEngComm

Electrochemical Growth of Spatially Organized Copper Microwire Arrays within Biomineralized (Dentine) Templates

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Supporting Information

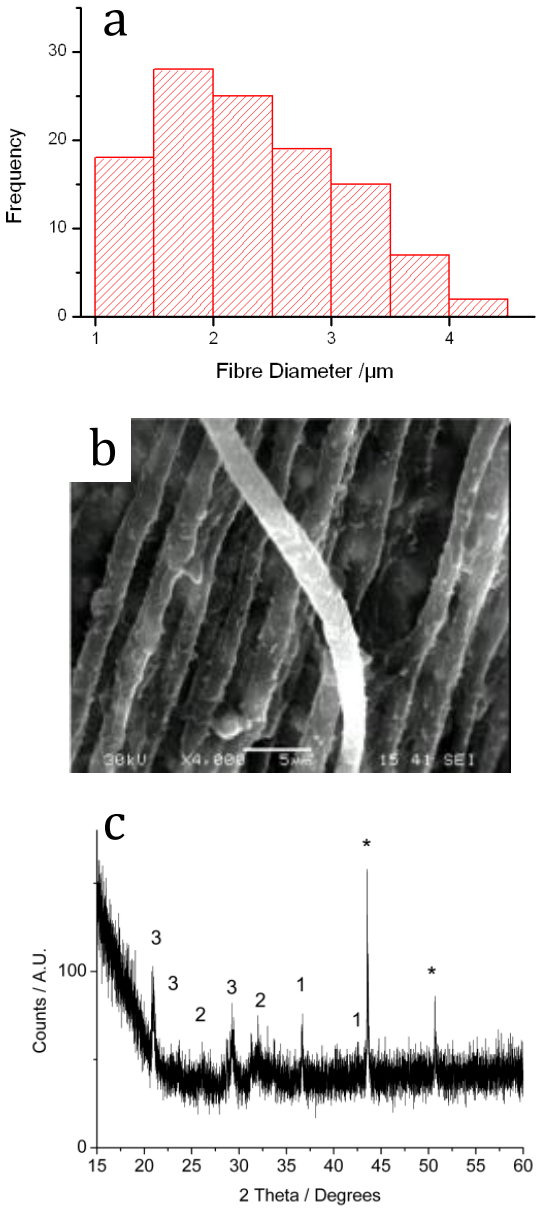

Fig. S1. (a) Distribution in thickness for copper microwires produced within dentinal tubules. (b) SEM image of a cross-sectioned metallized dentine composite showing ordered array of Cu microwires within the biomineralized matrix (c) XRD powder pattern of ground sample of metallized dentine composite showing for peaks for Cu (*), Cu_2O (3), apatite (2) and brushite (1).

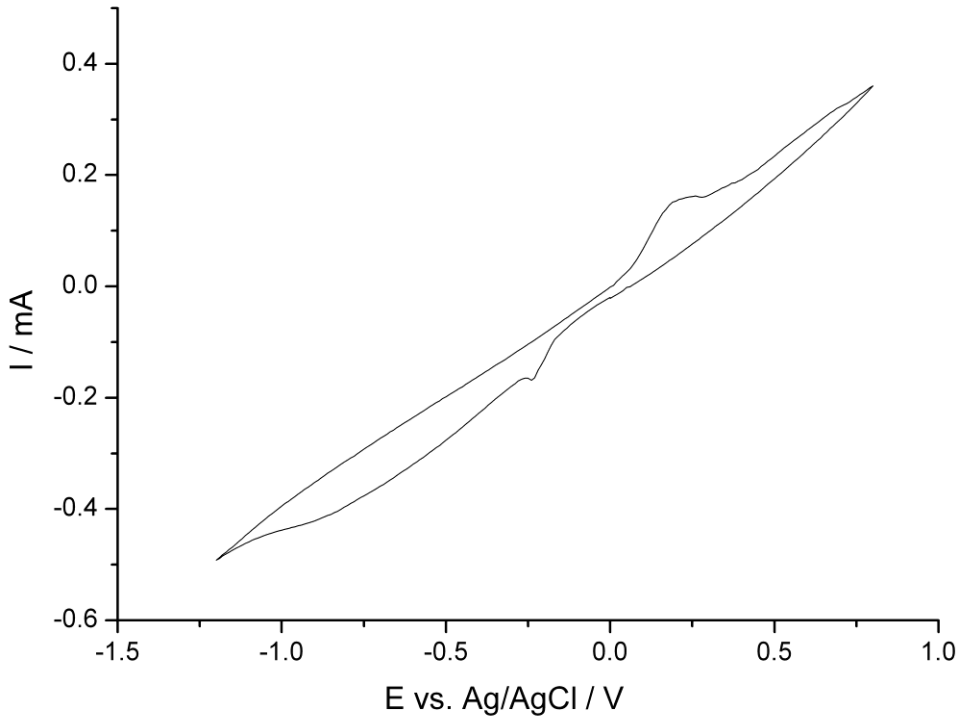

Fig. S2. Cyclic voltammogram of a dentine-masked electrode recorded in an electrolyte solution of 0.2 M $CuSO_4$, 0.75 M H_3BO_3 and 1 M Na_2SO_4 prior to the application of the electrodeposition potential. Scan rate: 0.1 V s^{-1}. The relatively large negative potential for Cu electrodeposition and the significant tilt in the voltammetric responses originate from a large uncompensated resistance (estimated as 2.5 kΩ) introduced by the porous template. Despite the large resistance and the corresponding shift in potentials, a peak associated with diffusion controlled deposition of Cu can be observed between -0.5 and -1.0 V, while the corresponding Cu stripping peak is present at 0.2 V.

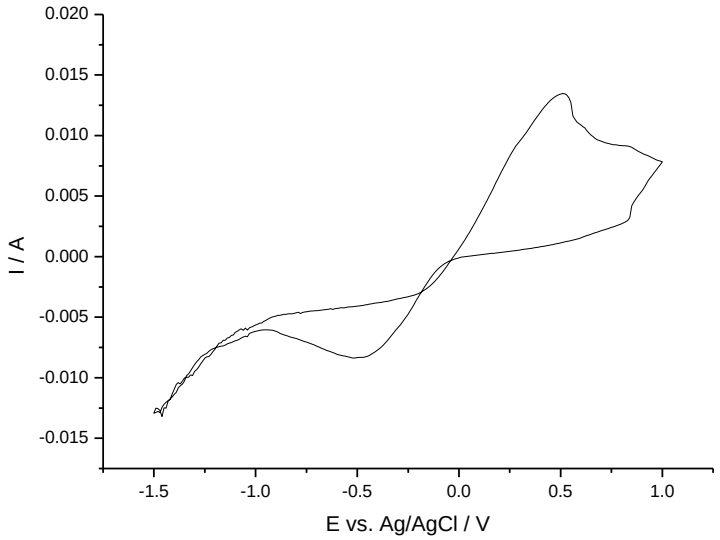

Fig. S3. Cyclic voltammogram of an unmasked electrode recorded in an electrolyte solution of 0.2 M $CuSO_4$, 0.75 M H_3BO_3 and 1 M Na_2SO_4. Scan rate: 0.1 V s^{-1}. A peak associated with diffusion controlled deposition of Cu is evident at -0. 5 V, a characteristic nucleation loop can be seen between 0.0 and -0.2 V and a Cu stripping peak is evident at 0.5 V.

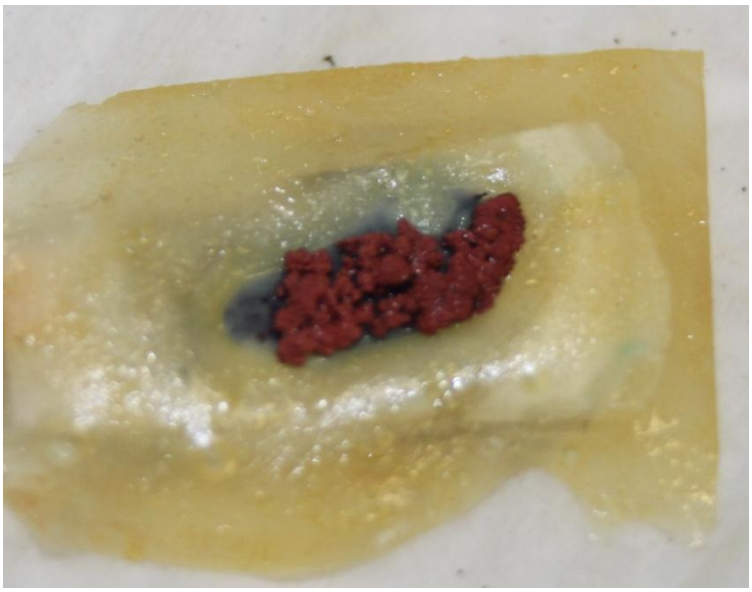

Fig. S4. Optical image of a template-masked working electrode after completion of electrodeposition showing bulk copper dendritic deposits on the template surface. The uncompensated resistance sharply decreased as the deposit grew over the dentine template.