Supporting Information

Water-born chitosan/CuO-GO nanocomposite as an antibacterial coating for functional leather with enhanced mechanical and thermal properties

Khandaker Tanzim Rahman[1,2], Md. Nur-E Alam[3] and M. Nuruzzaman Khan[1]*

[1]Department of Applied Chemistry and Chemical Engineering, Faculty of Engineering and Technology, University of Dhaka, Dhaka, 1000, Bangladesh

[2]Institute of Leather Engineering and Technology, University of Dhaka, Dhaka, 1000, Bangladesh

[3]Leather Research Institute, Bangladesh Council of Scientific and Industrial Research Dhaka, Bangladesh

*mnuruzzaman.khan@du.ac.bd

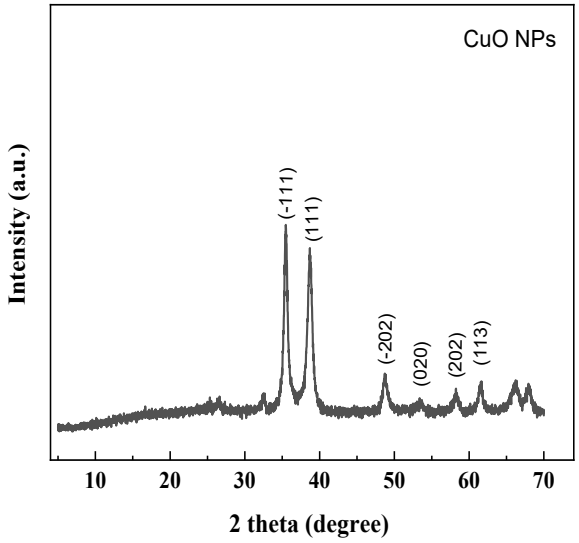

Fig S1. The X-ray diffractogram of CuO nanoparticles

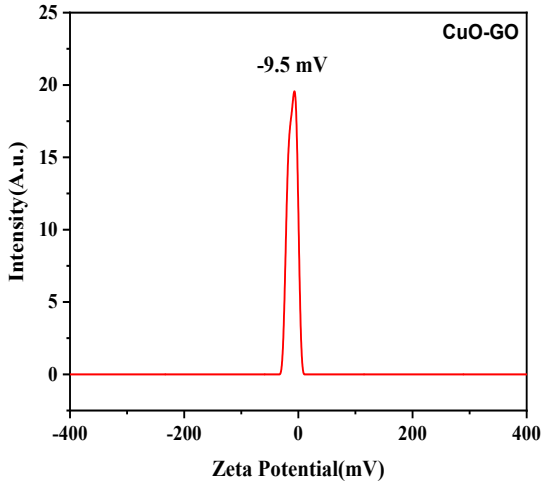

Fig S2. The zeta potential of CuO-GO nanocomposite

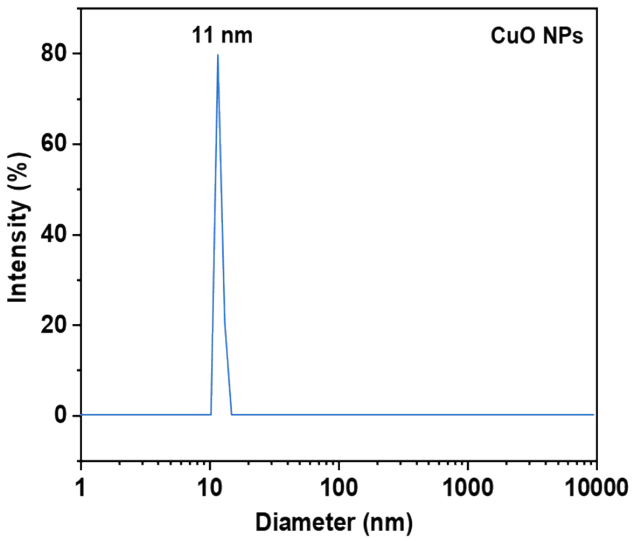

Fig S3. The particle size analysis of CuO NPs by DLS

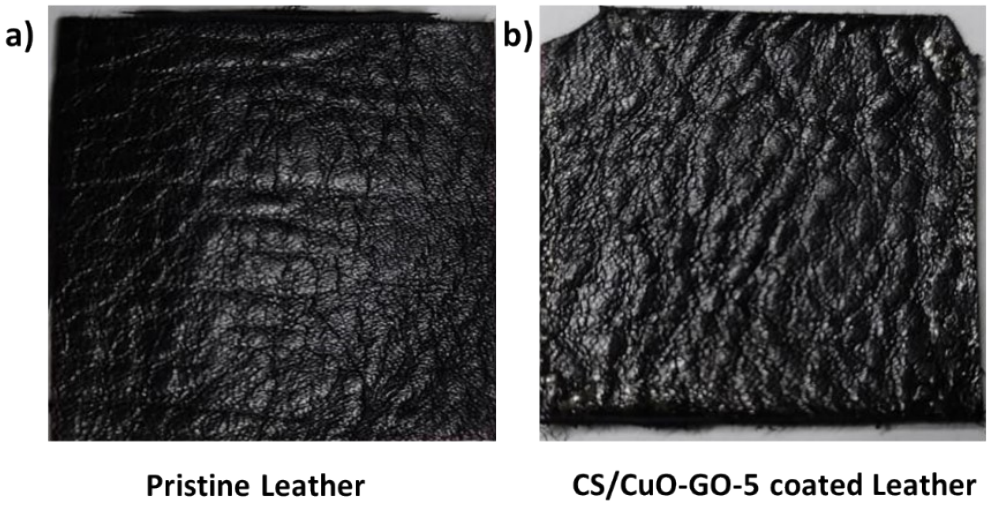

Figure S4. Optical images of a) pristine leather and b) CS/CuO-GO-5 coated leather

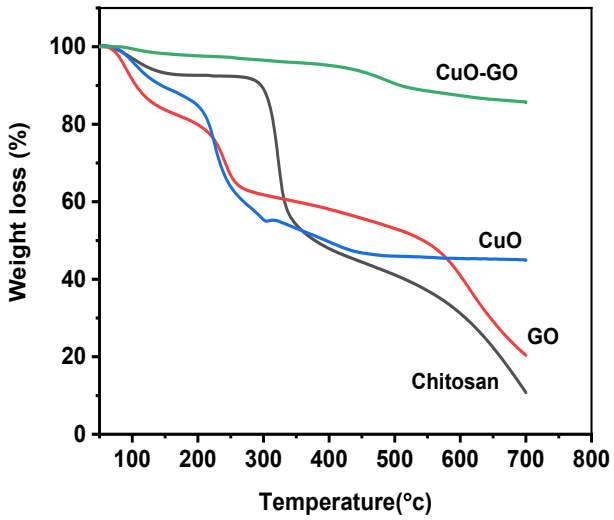

Figure S5. TGA thermogram of Chitosan, GO, CuO NPs, and CuO-GO nanocomposite

The TGA of chitosan, CuO-NPs, GO, and CuO-GO were presented in **Figure 2a.** The TGA thermogram of CS revealed three-degradation profile; the first weight loss was caused by the removal of moisture (around 10%) up to120°C. After this stage, the chitosan was nearly stable up to 290°C at which gradual decomposition began to take place. The second step occurs in the temperature range from 300 to 400°C, resulting in approximately 50% of weight loss. This step is attributed to the burning of organic hydrocarbon chains, cleavage of branched chains, depolymerization of sugar rings, and dehydration of molecular chains of CS. Finally, the third one appears between 400 and 700°C with a weight loss of about 90% and is assigned to the oxidative decomposition of the carbonaceous residue produced in the second thermal event [1]. Three significant weight loss stages were visible in the thermogram of CuO [2][3]. The first weight loss (about 20%) occurred up to 190^0C, which corresponded to the loss of physisorbed water. The second weight loss (about 50%) resembled pyrolysis and combustion of organic compounds and solvent, releasing CO, CO_2, and organic gases which occurred up to 350^0c. In the final stage above 350^0c, the constant straight line was observed, which confirms no further change occurred in the materials. In the GO TGA curve, the first weight loss occurred due to the loss of moisture up to

150°C. The second weight loss is caused by the removal of oxygen functional groups up to 270°C. After that stability of GO was decreased due to the decomposition of carboxylic groups and the release of CO_2 gas. At temperatures of 700°C, the total weight lost was found 80%. The CuO-GO TGA curve exhibits higher thermal stability than that of the other materials. At 750°C, the CuO-GO nanocomposite demonstrated a weight loss of only 14.6%, which is attributed to the decomposition and vaporization of various oxygen-containing functional groups on its surface contributing to its enhanced thermal stability [4][3].

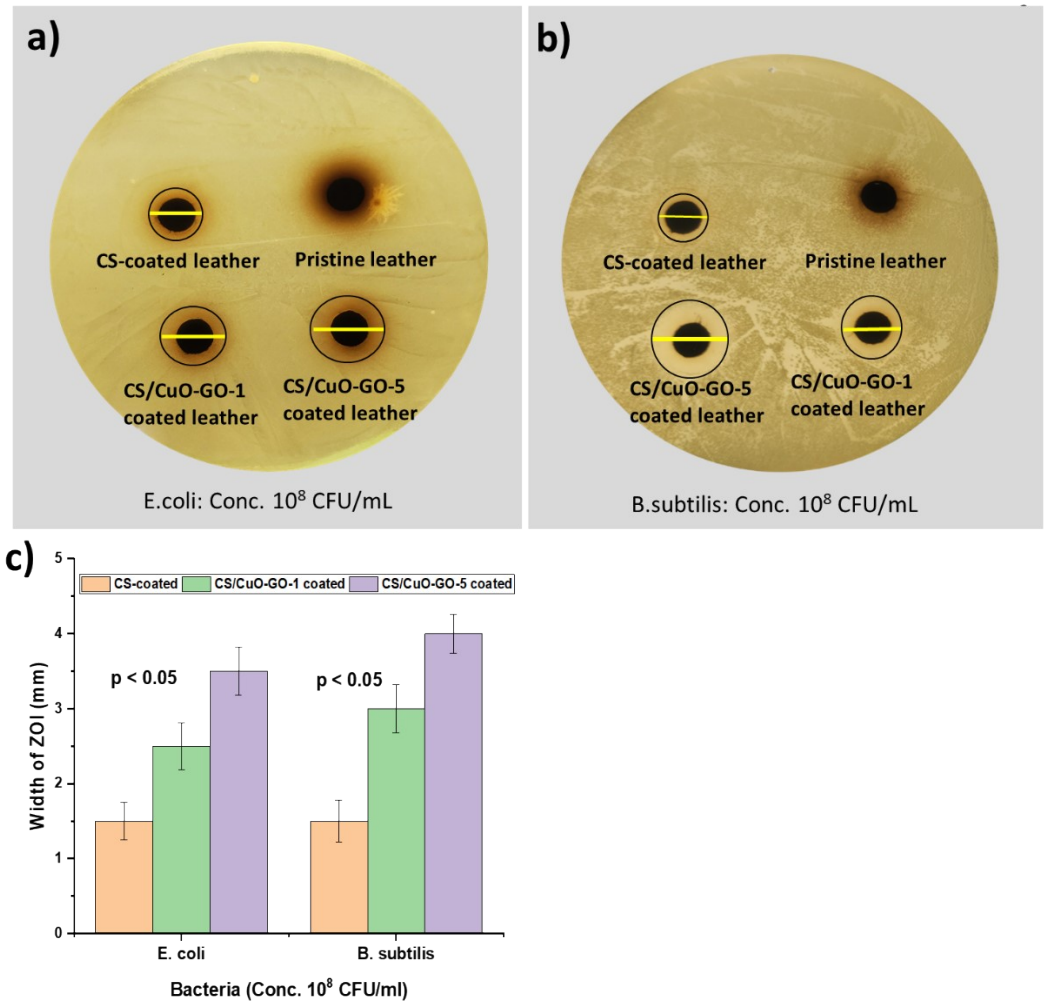

Figure S6. The ZOI of leather samples against E. coli (a) and S. subtilis (b), the average width calculated from the ZOI of each leather sample (c), and the bacteria-killing efficiency of leather samples after 1 h incubation with bacteria (d). All sample areas were circled to solid ring. Error bars represent mean ± SD (n≥3). *P was determined by the student's t-test.

References:

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