Copper-Silver Nanohybrids: SARS-CoV-2 Inhibitory Surfaces

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Supporting Information

Figure S1. Different plated surfaces with different colors as bronze (sample 1), dark brown (sample 2), and brown with surface imprinted COVIDSAFE making surface roughness (sample 3) delivered to the University of Helsinki to be tested for SARS-CoV-2 inhibition.

Figure S2. Hydrophobic powder sample (sample P) that painted the vial wall.
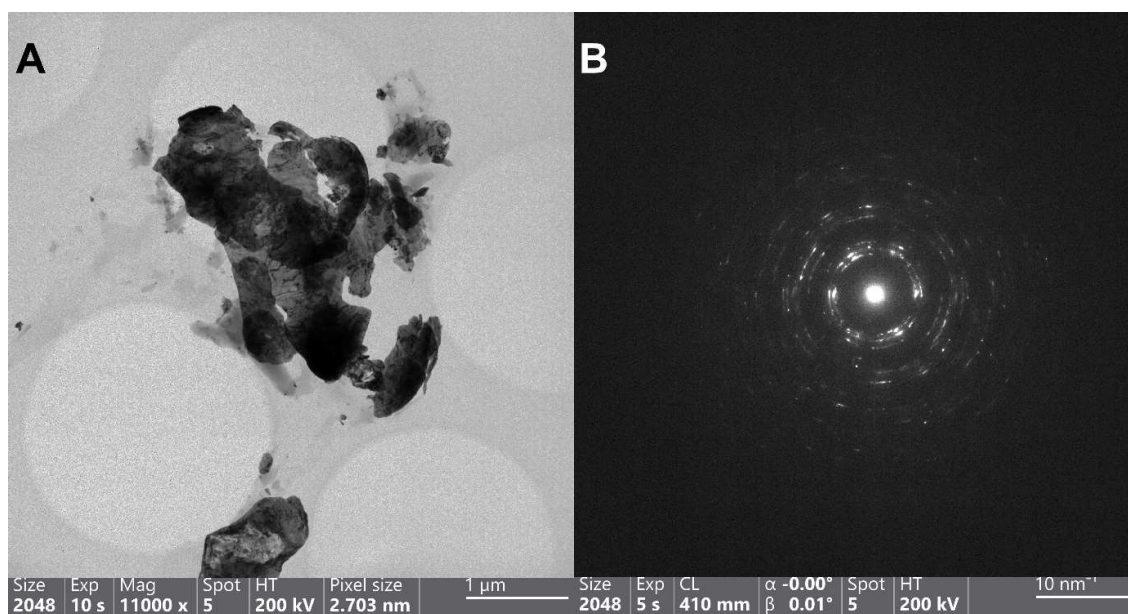
Figure S3. TEM image (**A**) of the Cu-Ag nanohybrid powder sample (sample P), showing clumps of a broad range of different sizes, ranging from 26 nm Ag NPs to 1.3 ± 0.2 μm copper particles, and shapes (irregular rounded, rectangular, and flakes) of particles, with some particles acting like a cave enclosing other smaller particles inside them. (**B**) Selected-area electron diffraction (SAED) ring pattern, depicting the crystalline Ag NPs mixed with Cu NPs.
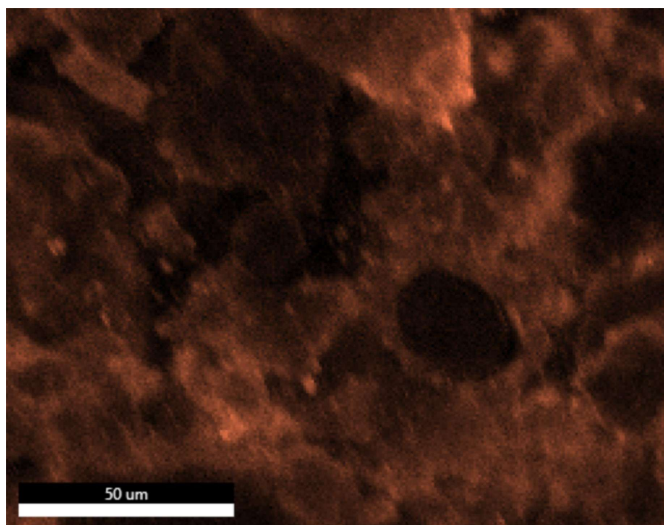
Figure S4. Ag map of Sample 2 demonstrate that the moon-shaped particles are not Ag NPS (without the orange color used to identify the Ag).

Table S1: EDX quantitative chemical composition of sample 2 in a concentration ascending order.

Element	Weight (wt)%	Atomic %	Error %
SiK	1.22	2.15	8.56
AlK	1.28	2.34	9.37
TiK	2.03	2.09	3.04
SnL	2.49	1.04	1.86
AgL	6.99	3.19	2.36
ClK	7.72	10.73	5.21
NaK	12.95	27.78	9.90
CuK	65.32	50.68	1.13

Table S2: EDX quantitative chemical composition of sample 3 in a concentration ascending order.

Element	Weight (wt)%	Atomic %	Error %
FeK	0.10	0.10	9.60
TiK	0.20	0.20	4.6
SnL	1.6	0.8	2.80
SiK	4.00	8.50	8.50
AlK	5.20	11.30	9.20
AgL	9.20	5.10	2.30
CuK	79.70	74.10	1.10
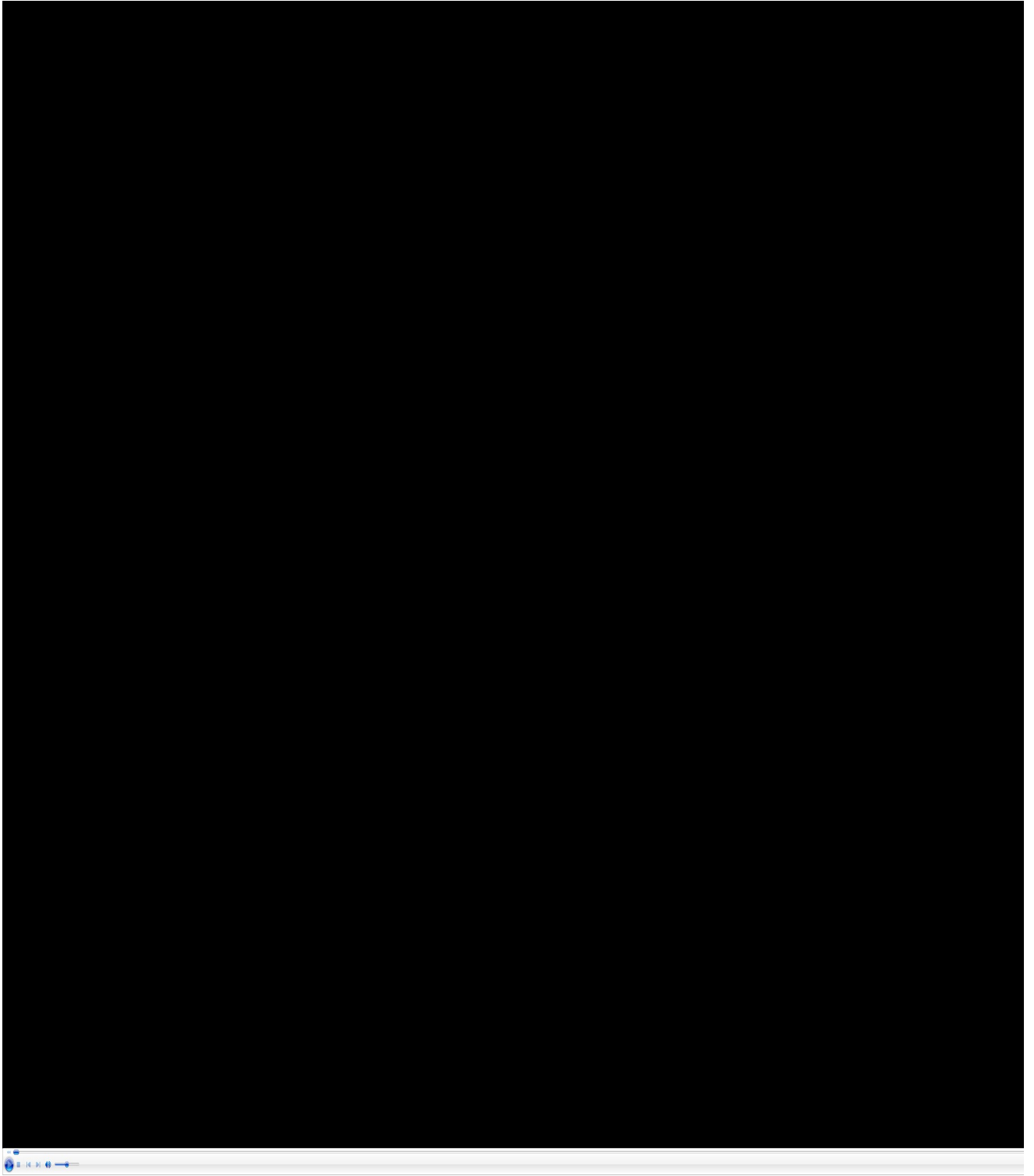
Video S1. Demonstration of the performance of the anti-SARS-CoV-2 surface (copper-silver nanohybrid plated surfaces) exposure tests in the BSL-3 laboratory.

Table S3. Inhibitory effects of Cu-Ag nanohybrid powder sample (sample 1) and plated surfaces (samples 2 and 3) on SARS-CoV-2 after three-time points based on the cytopathic effects. Two dilutions of each sample were cultured in two parallel reactions, and glass surfaces were used as a control. .

Sample	Dilution	1 min	5 min	10 min
Sample 1	1:1	+	+	+
	1:10	+	+	+
Sample 2	1:1	-	-	-
	1:10	-	-	-
Sample 3	1:1	+	-	-
	1:10	+	-	-
Glass	1:1	+	+	+
	1:10	+	+	+

+: Cytophatic effects observed on cells in both parallel wells

-: No cytopathic effects observed on cells in either of the parallel wells

Table S4. Ct-values of RT-PCR performed from post-culture media of individual wells.

Sample	Dilution	1 min		5 min		10 min	
Sample 1	1:1	16.43	16.39	16.95	16.82	17,21	16,63
	1:10	15.22	16.29	16.96	17.06	14,5	17,23
Sample 2	1:1	38.9	35.85	No Ct	No ct	35,11	36,82
	1:10	37.54	No ct	No Ct	No ct	37,4	37,49
Sample 3	1:1	17.06	16.03	33.80	33.50	33,83	34,59
	1:10	16.49	16.83	No Ct	37.11	35,68	No Ct
Glass	1:1	16.97	16.07	16.49	15.43	16	16.06
	1:10	16.29	16.21	35.05	17.26	16.02	23.76
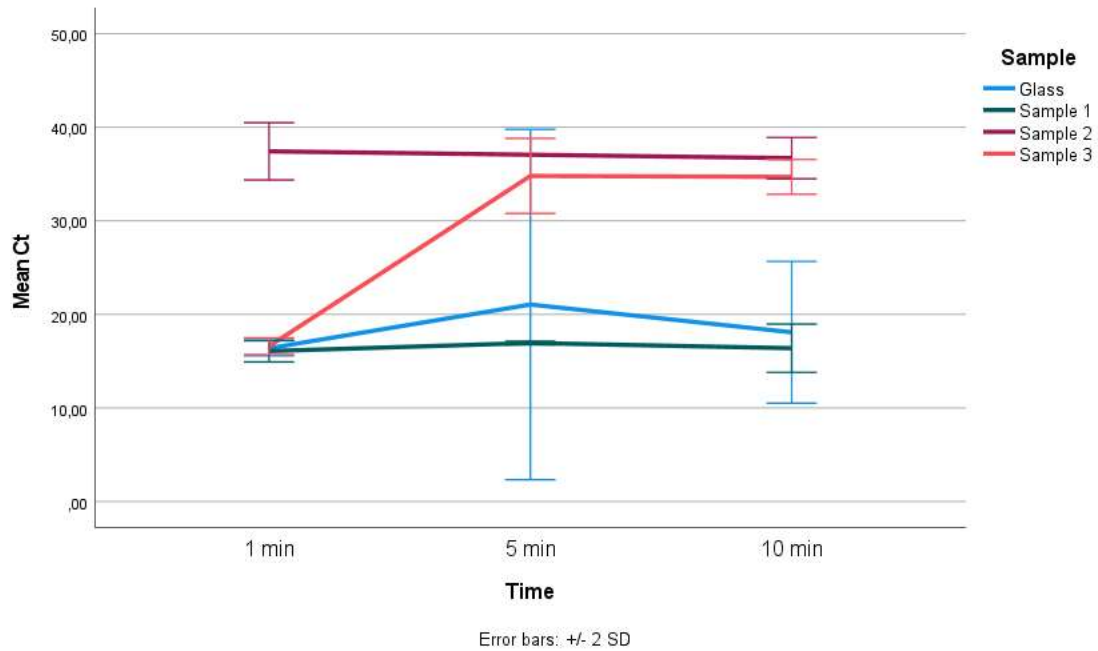
Error bars: +/- 2 SD

Figure S5. Inhibitory effects of Cu-Ag nanohybrid plated surfaces (i.e., samples 1, 2, and 3) on the SARS-CoV-2 growth after the time points of 1, 5 min, and 10 min based on RT-PCR performed from culture media. The error bars represent the standard deviation of the means from duplicates executed in BSL3. It remains good to notice the considerable error detected for the non-reactive glass samples that might be elicited from an unnoticed pipetting error.