

Supporting Information

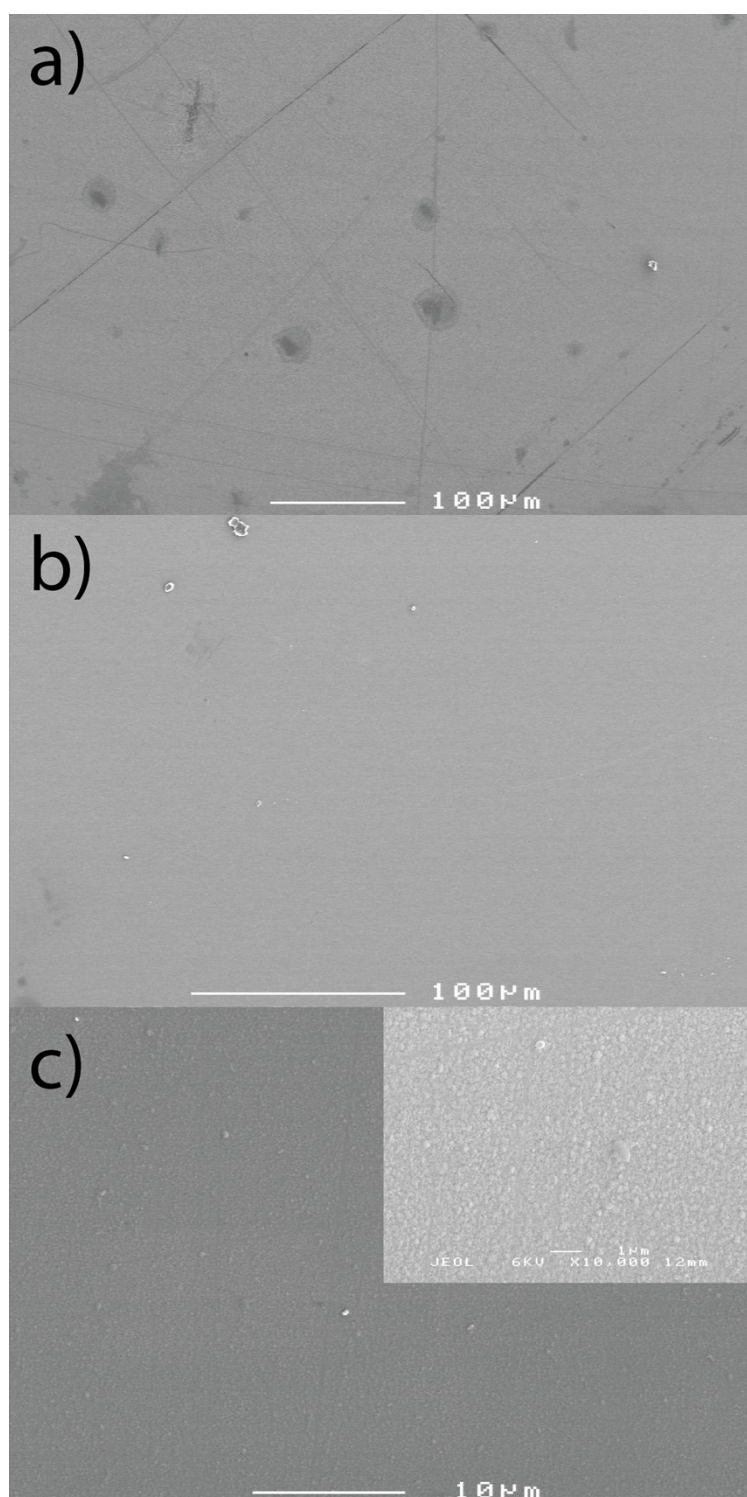


Figure 1: SEMs of the a) Cu, b) ZrO₂ and c) Cu-ZrO₂ (magnified image inset) films after light abrasion test using a metal spatula. The Cu film was readily scratched by whereas the ZrO₂ and the composite Cu-ZrO₂ were more resistant to damage. The low magnification SEM images also the films free of cracks and pinholes.

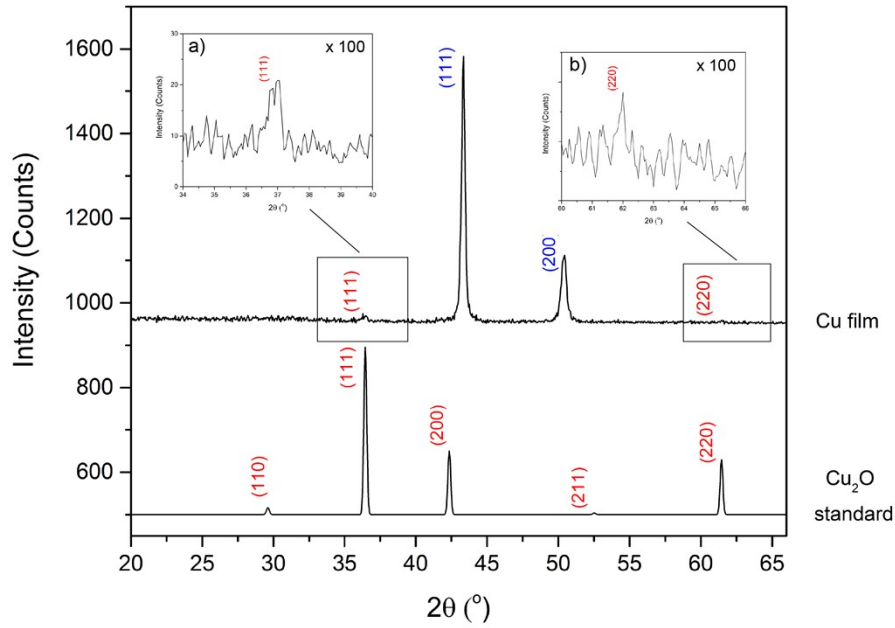


Figure 1 (SI): The XRD pattern for the Cu film grown *via* AACVD. When the 34-40° and 60-65° 2θ regions are magnified peaks matching to the (111) and (220) reflections of Cu₂O (standard pattern also shown) are evident. Note (hkl) values in red are for Cu₂O and blue for Cu metal.

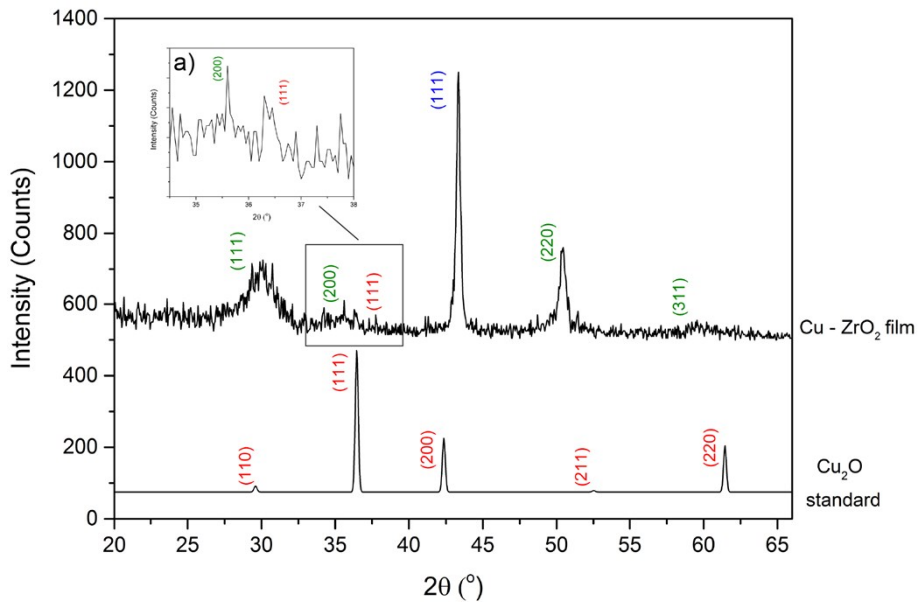


Figure 2 (SI): The XRD pattern for the Cu – ZrO₂ film grown *via* AACVD. When the 34-40° 2θ region magnified peaks matching to the (111) Cu₂O (standard pattern also shown) is evident. Note (hkl) values in red are for Cu₂O, green for ZrO₂ and blue for Cu metal.

Table 1: Estimated crystallite size calculated from XRD data using the Debye – Scherrer formula.

| | hkl | Bragg Angle 2θ/° | θB/rad | cos(θB) | βcos(θB) | Diameter/nm |
|-------------------------|-------------------------|---------------------|--------|---------|----------|-------------|
| Cu | 111 | 43.3 | 0.3782 | 0.9293 | 0.0051 | 27 |
| | 200 | 50.4 | 0.4397 | 0.9049 | 0.0069 | 20 |
| ZrO ₂ | 111 | 30.4 | 0.2649 | 0.9651 | 0.0169 | 8 |
| | 200 | 35.2 | 0.3068 | 0.9533 | 0.0142 | 10 |
| | 220 | 50.6 | 0.4413 | 0.9042 | 0.0236 | 6 |
| Cu- ZrO ₂ | 111 (ZrO ₂) | 30.0 | 0.2614 | 0.9660 | 0.0348 | 4 |
| | 111 (Cu) | 43.3 | 0.3782 | 0.9293 | 0.0057 | 24 |
| | 220 (ZrO ₂) | 50.4 | 0.4399 | 0.9048 | 0.0092 | 15 |

Table 2: XPS elemental analysis showing peak area and corrected peak area for a) Cu (0) / Cu (I) 2p b) Cu (II) 2p and Zr (IV) 2p. c) Shows the Cu to Zr and Cu (0) / Cu(I) to Cu (II) ratios.

a)

| | Cu (0) / Cu (I) |
|------------------------|-----------------|
| 2p _{3/2} area | 237752 |
| 2p _{1/2} area | 118876 |
| 2p area | 356627 |
| R.S.F | 6.3 |
| Corrected 2p area | 56608 |

b)

| | Cu (II) |
|------------------------------|---------|
| 2p _{3/2} area | 39658 |
| 2p _{1/2} area | 19829 |
| 2p area | 59488 |
| Shake-up satellite peak area | 13398 |
| R.S.F | 6.3 |
| Corrected area | 11569 |

c)

| | Zr (IV) |
|------------------------|---------|
| 3d _{5/2} area | 38108 |
| 3d _{3/2} area | 25418 |
| 3d area | 63526 |
| R.S.F | 2.1 |
| Corrected 2p area | 30250 |

d)

| | |
|-------------------------|-----|
| Cu : Zr | 2.3 |
| Cu (0)/Cu (I) : Cu (II) | 4.9 |

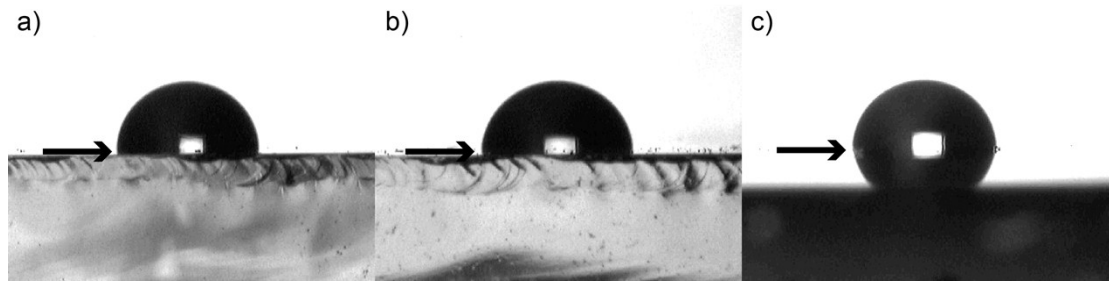


Figure 3 (SI): The water contact angle on the surface of a) Cu, b) ZrO_2 and c) Cu - ZrO_2 films grown *via* AACVD at 430 °C. The arrows show the contact line.

Wettability studies on the films determined *via* water contact angle measurements show that the contact angle is similar (ca. 95°) for all the AACVD prepared films. Thus eliminating the contact between the bacteria solution and the film as a variable.