

SEAM July 2021 ECR Forum

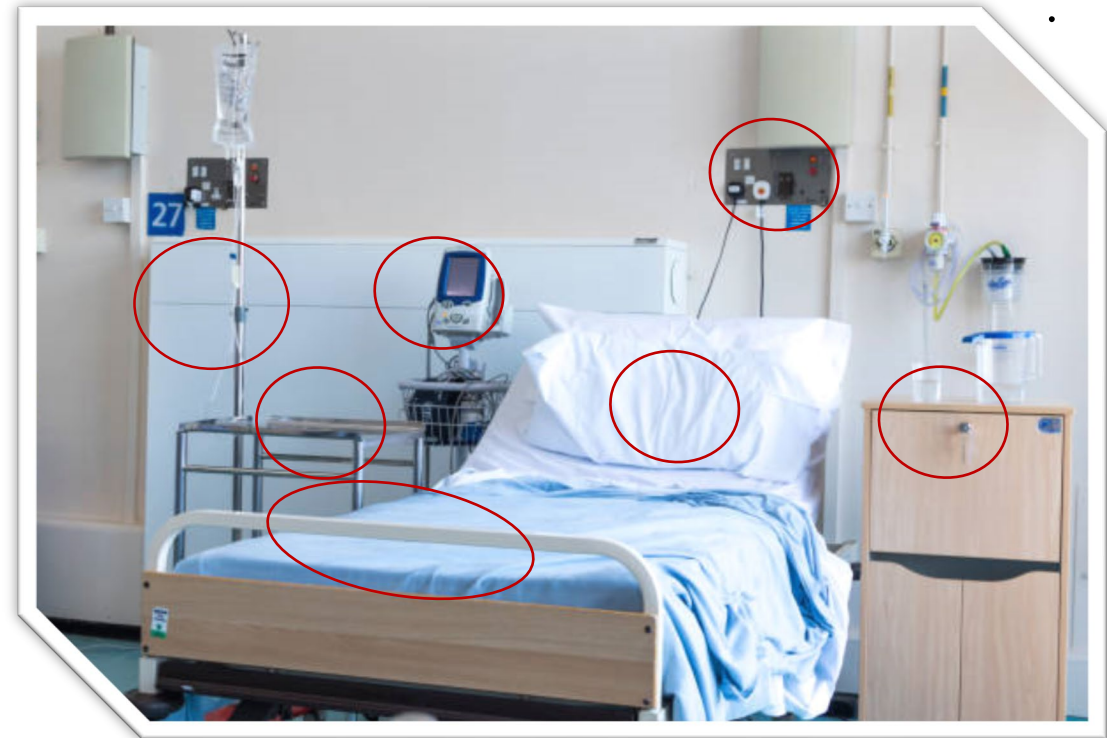
Defending against Pathogens via Surface Engineering

Presented by Sandy Liao

28th July 2021

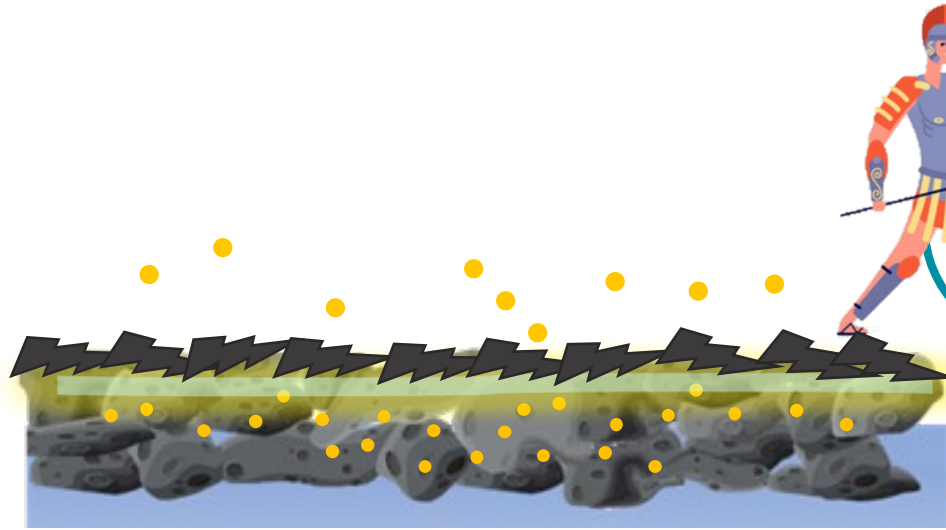


Human pathogen transmission via high touch surfaces



Multiple lines of defense

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Contact killing: Rough/spiky surface



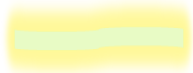
Low fouling surface: Protection layer



Release killing: Antimicrobial agent releasing



Surface hierarchical structure



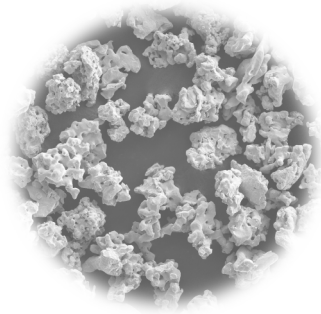
Low fouling property



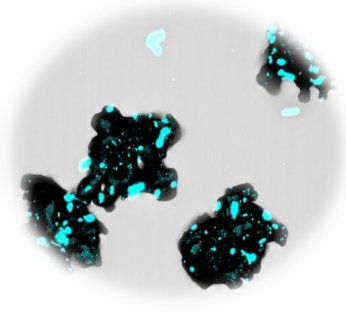
Released antimicrobial agent

Surface engineering

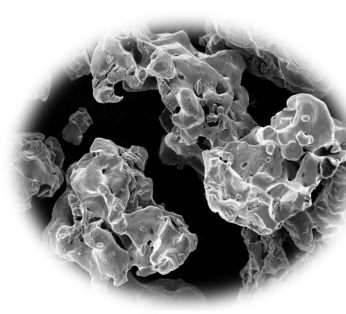
Microparticle surface modification



Cold spray material
Porous titanium

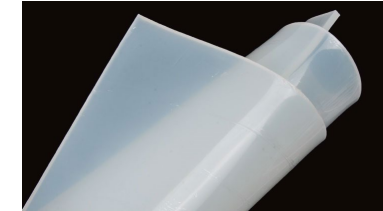


Porous titanium +
antibiotic crystals (●) embedded

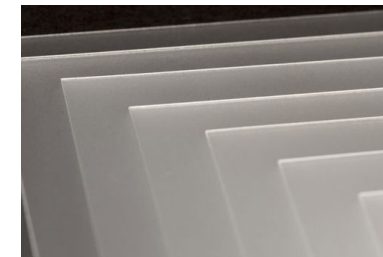


Porous titanium + antibiotic
+ Polymer coating layer

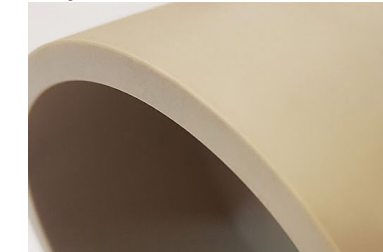
Silicon rubber (PDMS)



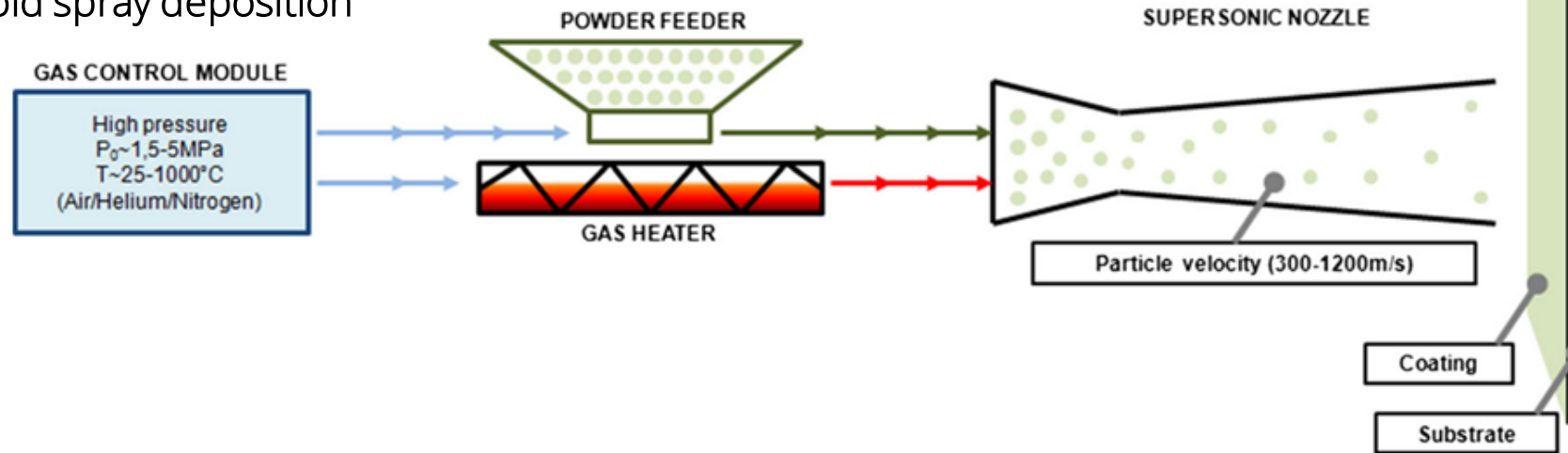
High density polyethylene (HDPE)



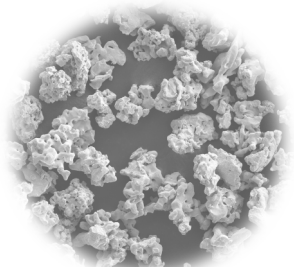
Polyetheretherketone (PEEK)



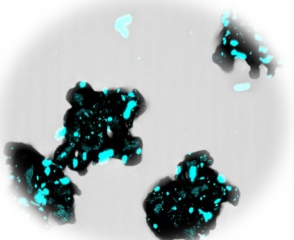
Cold spray deposition



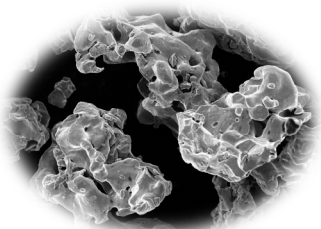
Latest research outcome



Cold spray material
Porous titanium

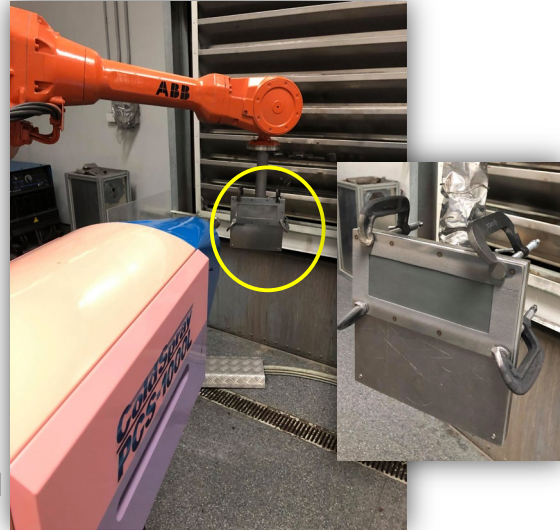


Porous titanium +
antibiotic crystals embedded

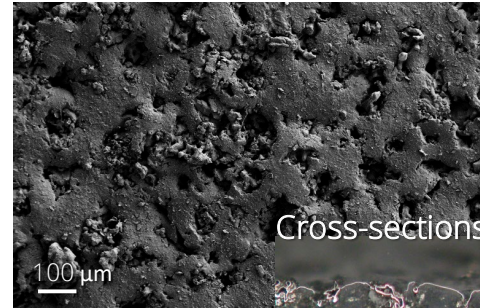


Porous titanium + antibiotic
+Polymer coating layer

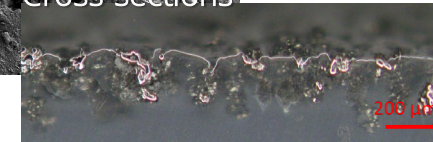
Cold spray deposition



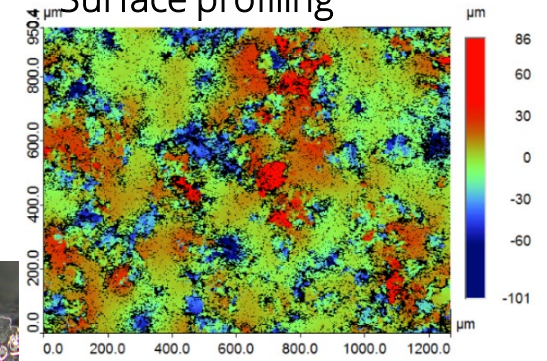
Surface structure



Cross-sections



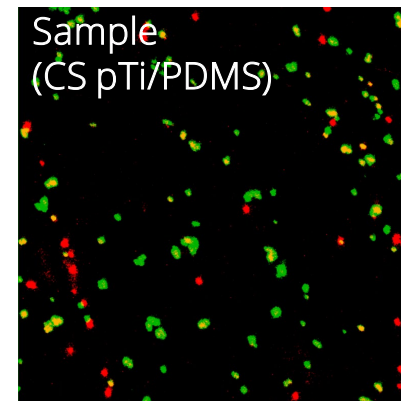
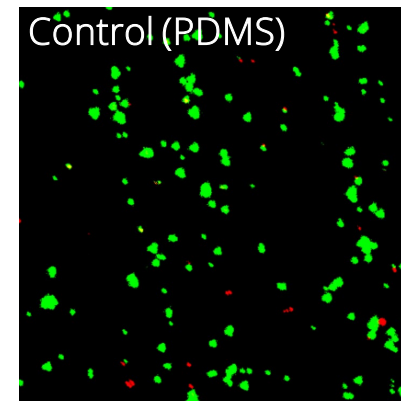
Surface profiling



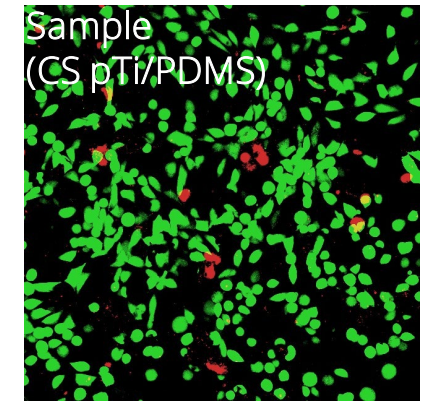
Sa 11.83 μm

Bacteria attachment (*S.aureus*)

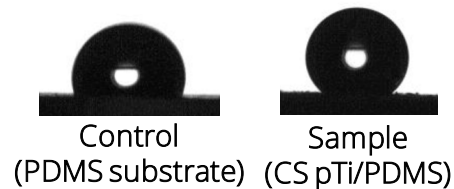
- Live cells
- Dead cells



Biocompatibility (Mammalian cells)



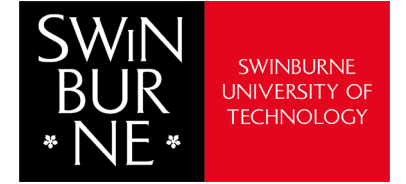
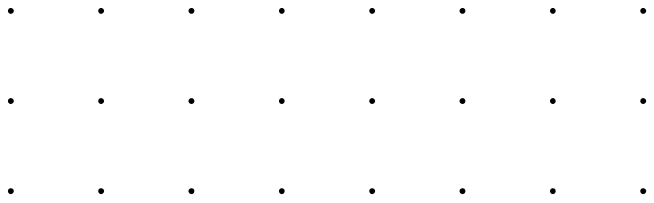
Wettability



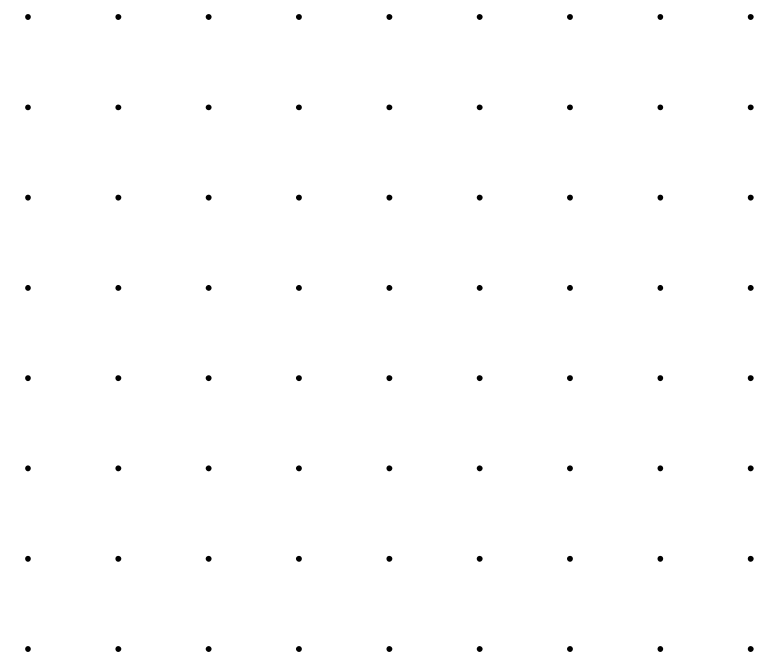
Control

Sample

(PDMS substrate) (CS pTi/PDMS)



Thank you for listening



References

1. Cobrado, L., Silva-Dias, A., Azevedo, M.M. et al. High-touch surfaces: microbial neighbours at hand. *Eur. J. Clin. Microbiol. Infect. Dis.* 36, 2053–2062 (2017).
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3. Chang, T., Sepati, M., Herting, G., Leygraf, C., Rajarao, G.K., Butina, K., Richter-Dahlfors, A., Blomberg, E., Odnevall Wallinder, I., 2021. A novel methodology to study antimicrobial properties of high-touch surfaces used for indoor hygiene applications—A study on Cu metal. *PLOS ONE* 16, e0247081.. doi:10.1371/journal.pone.0247081
4. Vilardell, A.M., Cinca, N., Concustell, A., Dosta, S., Cano, I.G., Guilemany, J.M., 2015. Cold spray as an emerging technology for biocompatible and antibacterial coatings: state of art. *Journal of Materials Science* 50, 4441–4462.. doi:10.1007/s10853-015-9013-1

Website

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