Supporting Information

Selective Laser Melting of Integrated Ti6Al4V ELI Permeable Walls for Controlled Drug Delivery of Vancomycin

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Part Design and Fabrication

In order to directly fuse different components to produce an assembly part with selective laser melting (SLM), oversized dimensions are designed for certain sections of individual components and, instead of creating an assembly during design, the components are left to float in 3D-space. This allowed for allocating different process parameters to specific regions of the final part. Furthermore, the oversized design ensured accurate fusion of components. The final part is then assembled by laser re-melting at the interfacing regions. A reservoir with a graded permeable wall composed using this method, is shown in Figure S1a, where the components assigned different parameters and fused with re-melting at the interfering interfaces are numbered from 1 to 4 on both the 3D model (left) and an optical microscope image of the actual part (right). Figure S1b presents a model of the permeable thin wall and Figure S1c the reservoir with integrated permeable wall samples utilized in this study.

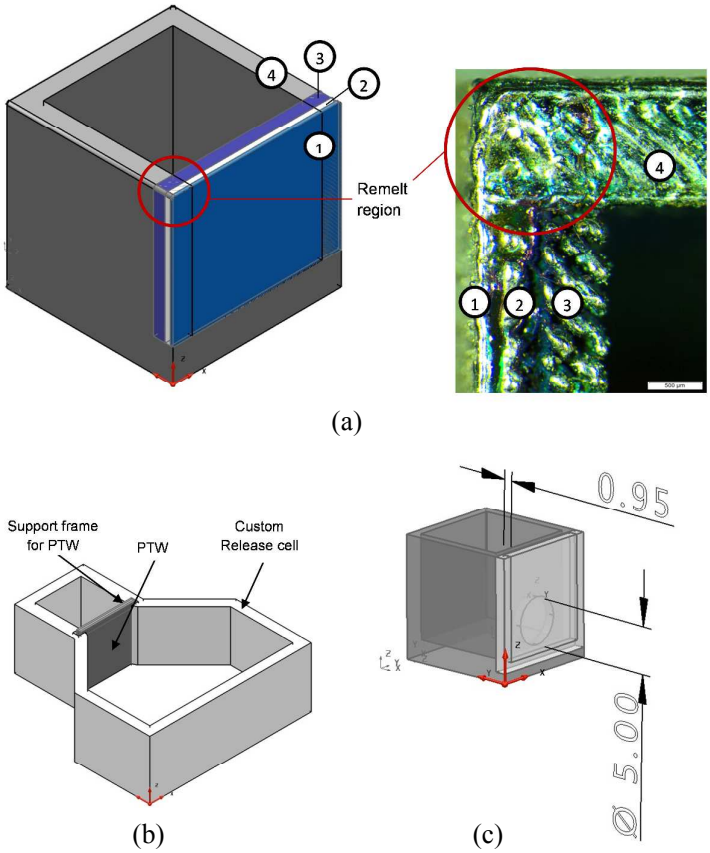

Figure S1. Concept of integrated permeable structures with a) specimen containing a graded wall of different porosities, b) 3D model of PTW inside support frame within a custom designed ABS release cell, and c), 3D model of the reservoir specimen containing a 5 mm diameter hole and 950 μm integrated permeable wall.

Water contact angle

The experimental setup for imaging of water droplets is presented in Figure S2 below. Specifications as set out in ASTM D7334-08 were followed in preparing the customized setup.

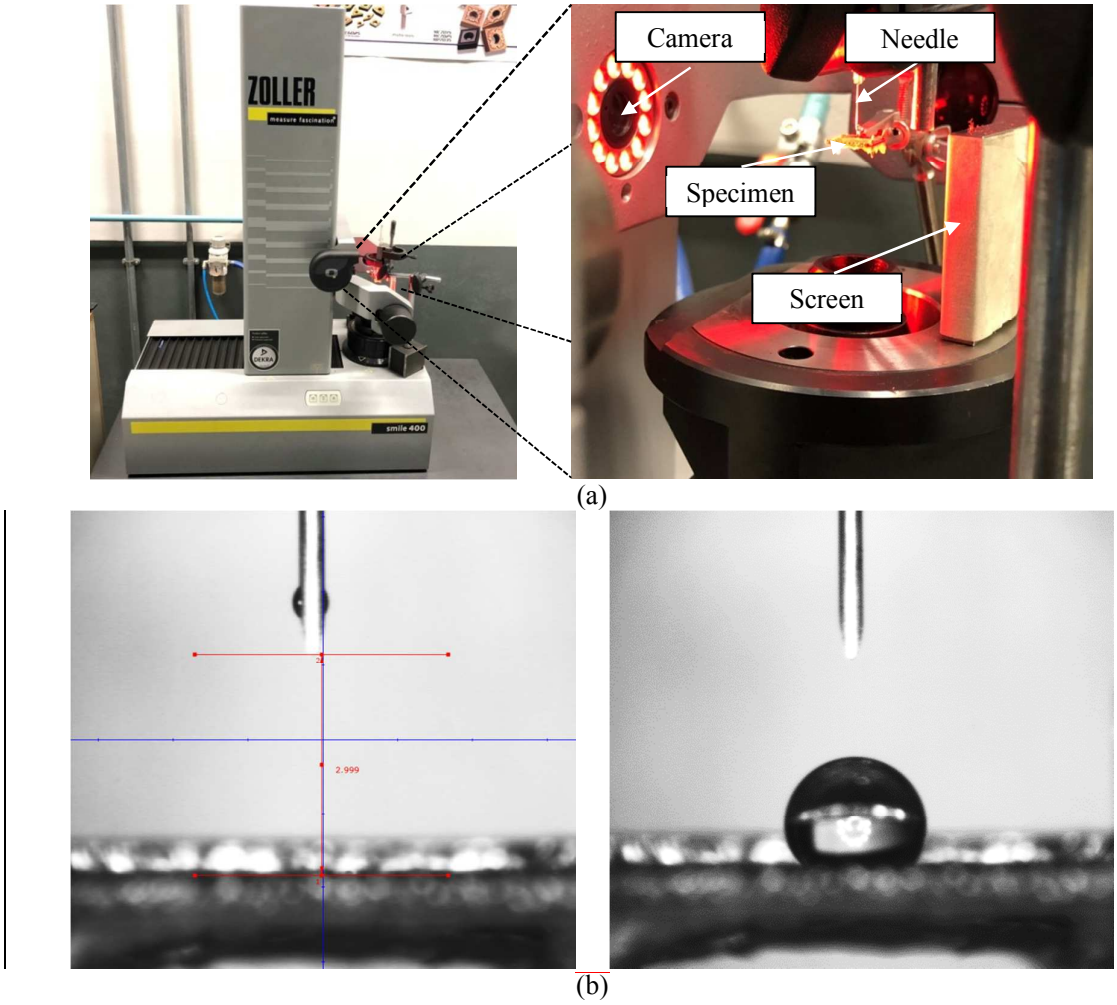

Figure S2. Static water contact angle measurement with (a) the physical configuration, and (b) image examples.

The volume of the droplet was determined by depositing a single droplet on a PTW and weighing the specimen on an analytical balance (Kern & Sohn GmbH, Balingen, Germany). Mass measurements of the distilled water droplet were converted to volume under an assumed density of 1 g/cm^3. The mass measurements are presented in Table S1.

Table S1. Water droplet mass measurements

Measurement No.	Mass (mg)
1	3.57
2	3.45
3	3.73
4	3.47
5	3.23
6	3.44
Average ± Standard Deviation	3.48 ± 0.16

A time series of screen shots of the water droplet imbibed into the 950 μm thick permeable wall is presented in Figure S3. Video frames before surface contact and after imbibition were identified using a commercially available digital audio workstation software.

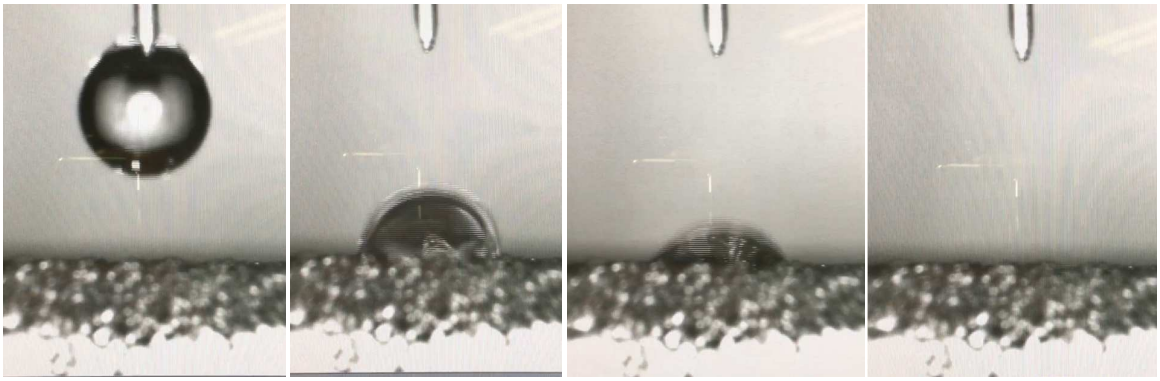

Figure S3. Video frames for time series of sessile droplet imbibed into 950 μm integrated permeable wall produced with PS-10.

Antimicrobial activity of released vancomycin

Images for activity of vancomycin released through the PTWs against *Staphylococcus aureus* Xen 36 are presented in Figure S4 below.

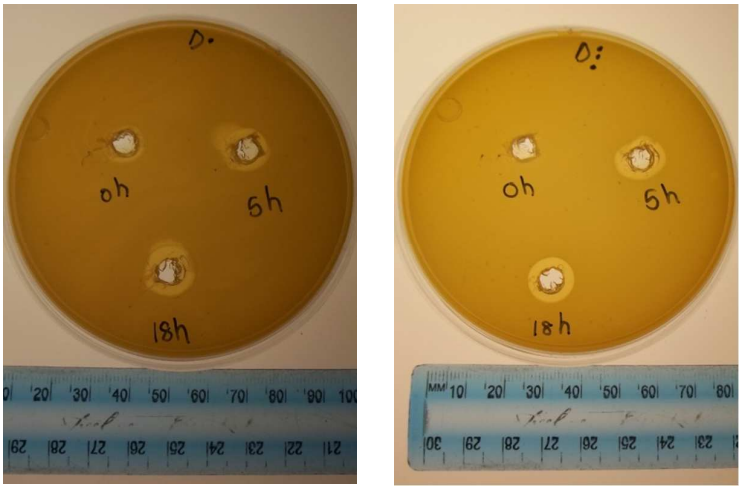

Figure S4. Antimicrobial activity of vancomycin released through PTWs produced with PS-10.

Figure S5 below presents photographs of the antimicrobial activity of vancomycin released from integrated reservoirs against *Staphylococcus aureus* Xen 36.

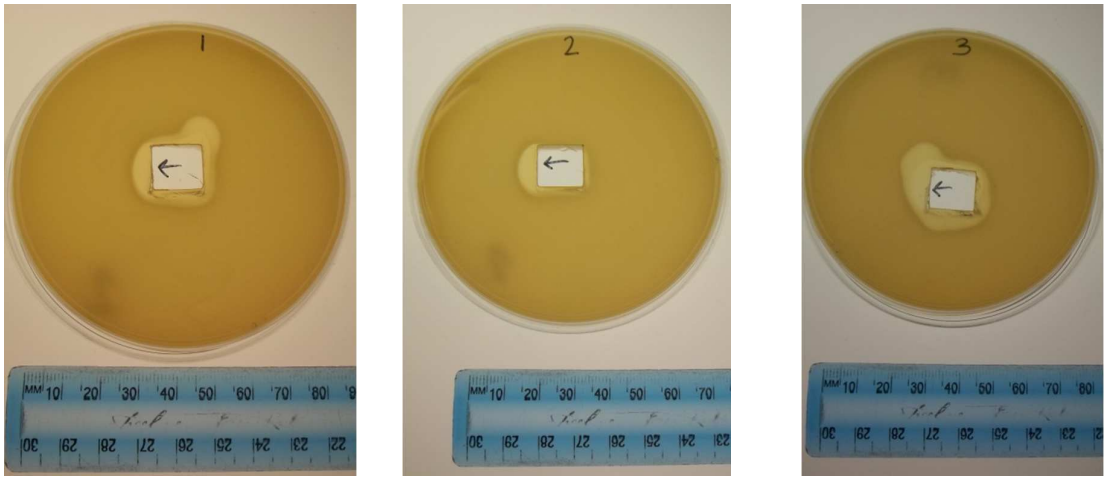

Figure S5. Antimicrobial activity of vancomycin released for 18 h through integrated reservoirs with integrated 950 µm thick permeable walls with PS-10. Note; the specimens were removed for image clarity; arrows indicate the side of the permeable wall.