Remote Magnetic Actuation of Micrometric Probes for in situ 3D Mapping of Bacterial Biofilm Physical Properties

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Materials

Name | Company | Catalog Number | Comments
---|---|---|---
Magnetic particles | Life technologies | 14307D | Micrometric magnetic particle, 2.8 µm diameter
Ampicillin (Antibiotic) | Sigma-Aldrich | A9518 | 
Tetracycline (Antibiotic) | Sigma-Aldrich | 87128 | 
Bacterial strain MG1655gfpF | UGB, Institut Pasteur, France | | Produces F pili at its surface, resistant to Ampicillin and tetracycline.

Filters for pediatric perfusion | Prodimed-Plastimed | 6932002 | 
Hollow Square Capillaries | Composite Metal Scientific | 8280-100 | Manufactured in Borosilicate glass. Square 0.8 mm x 0.8 mm
Tubing silicone peroxyde | VWR International | 228-0512 | Diameter 1 mm
Tubing silicone peroxyde | VWR International | 228-0700 | Diameter 3 mm

Lysozyme Broth (LB) solution | Amresco-VWR | J106-10PK | Standard medium used to grow bacteria.
M63B1 solution | Home-made | | Standard minimum medium used to grow bacteria.
Glucose | Sigma-Aldrich | G8270 | Used to make M63B1 medium with 0.4% glucose.

Camera EMCCD | Hamamatsu | C9100-02 | 
Heater controller | World precision instruments | 300354 | 
Function generator | Agilent technologies | 33210A | 
Power amplifier | Home-made | | It gives a current signal with amplitudes up to 4 A.
Syringe pumps | Kd Scientific | KDS-220 | 
Shutter | Vincent Associates | Uniblitz T132 | 
Magnetic tweezers | Home-made | | Two electromagnetic poles, each made of a copper coil with 2,120 turns of 0.56 mm in diameter copper wire and soft magnetic alloy cores (Supra50-Arcelor Mittal, France) square shaped according to the blueprint shown in Figure 10. The two cores are mounted north pole facing south pole, in...
In order to generate a magnetic force in one direction along the length of the capillary, see coil wiring details in Figure 11.

Table 5: Optics

<table>
<thead>
<tr>
<th>Inverted microscope</th>
<th>Nikon</th>
<th>TE-300</th>
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<tbody>
<tr>
<td>S Fluor x40 Objective (NA 0.9, WD0.3)</td>
<td>Nikon</td>
<td>This a long working distance objective enabling observation of the biofilm in the depth.</td>
</tr>
<tr>
<td>Epifluorescence filters: 1) for green fluorescence: Exc 480/20 nm; DM 495; Em 510(20 2) for Red fluorescence: Exc 540/25 nm; DM 565; Em 605/55</td>
<td>Chroma 1)#49020 2)#31002</td>
<td>Particle displacement upon force application is recorded using the red fluorescence filter block.</td>
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Table 6: Image analysis

<table>
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<tr>
<th>ImageJ</th>
<th>NIH - particle tracker plugin</th>
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