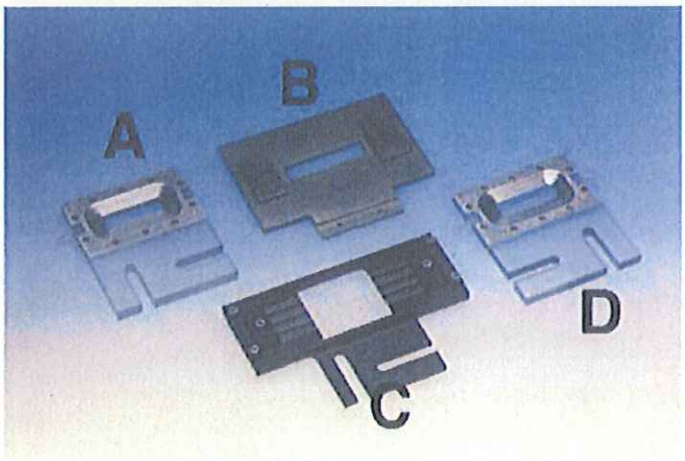
BioSurface Technologies, Corp.

Biofilm Flow-Cells

Flow-cells are designed to allow visual observation of biofilm development and growth using microscopy and image analysis. BioSurface Technologies currently offers four models of flow-cells for microscopic image analysis: BST Model FC 71, Model FC 81, Model FC 91, and Model FC 93.

All BST flow-cells are completely autoclavable and reusable and are compatible with upright and inverted light, epifluorescence and confocal microscopes



BST Flow-Cells **A**: FC 81, **B**: FC 91, **C**: FC 93, **D**: FC 71

FC81 positioned on the stage of an upright microscope.

BioSurface Technologies, Corp.

The **BST Model FC 71** Flow-cell provides a flow channel of approximately 0.008" (0.203 mm) deep by 0.45" (11.4 mm) wide by 1.6" (40.6 mm) long. The flow channel has a recess, 0.075" (2 mm) deep, 0.985" (25 mm) long, 0.235" (6 mm) wide, to accommodate coupons of different materials. Reflected light, epi-fluorescence or confocal microscopy capabilities are required to visualize the surface of the coupon.

Modification coupon options

Instead of the single rectangular coupons BST offers options to use multiple coupons in one flow cell. This allows multiple samples for replications or the simultaneous use of different surfaces for direct comparison on biofilm attachment and growth. Options include:

Two (2) ½ inch diameter, 2 mm deep wells or three (3) 10 mm diameter, 2 mm deep wells spaced in a row along the centerline of the flow cell. Another option is six (6) 5.5 mm diameter wells, 2 mm deep, positioned in two rows of three.

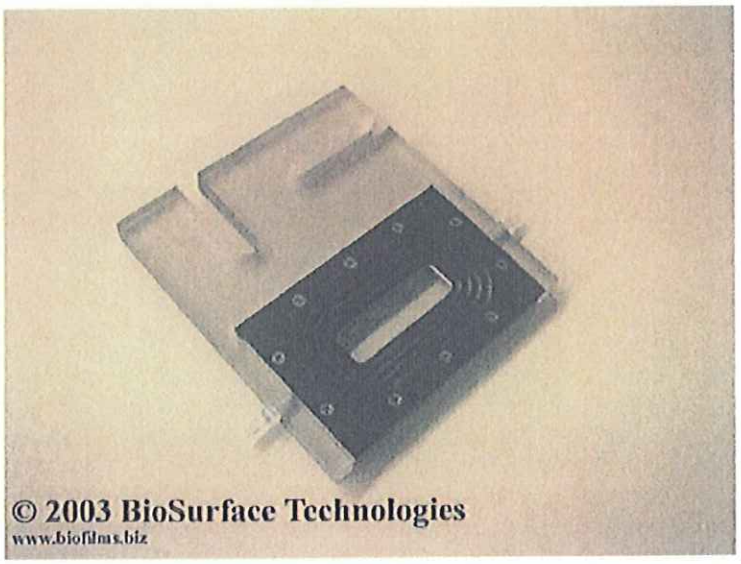
Custom made flow cells: BST will work with you to design a flow cell for your specific needs. Pricing will vary with design complexity and quantity.

BioSurface Technologies, Corp.

BST Model FC 81 flow-cell provides a flow chamber 2.0" (50.8 mm) long by 0.5" (12.7 mm) wide by 0.10" (2.54 mm) deep. The flow chamber is contained on one side by a 60 mm x 24 mm no. 2 glass cover slip, while the opposite side is contained by a standard glass microscope slide. The Model FC 81 provides a mounting base to allow direct attachment to a microscope stage. The biofilm can be viewed using transmitted, epi-fluorescence, or confocal microscopy.
The new design allows easier assembly and now accommodates the same top plate and silicone gaskets as the FC71 allowing a greater degree of parts interchange between the two models.

Both the BST Flow-Cell models FC 71 and FC 81use commercially available microscope slide cover slips (60 x 24 mm) and/or microscope slides as viewing windows. The use of cover slips as viewing windows combines high quality optical glass, thin dimensions (increases working focal depth into the chamber) and low cost.

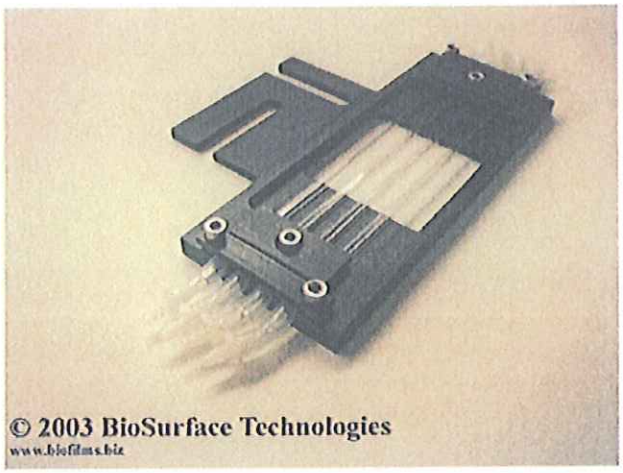
NEW DESIGN



BioSurface Technologies, Corp.

The **BST Model FC 91** and **FC 93** are multi-channel capillary flow cells utilizing square capillary tubing. The FC 91 uses 1 mm square glass tubing that allows the use of short working length and oil and water immersion lenses. The Model FC 93 uses 3 mm square tubing that allows observation of biofilm development with long working length lenses. High shear rates can be obtained in both capillary flow cells. Both flow cells hold up to four (4) separate capillary flow channels.

FC91 This flow cell houses four 1 x 1 mm square glass channels for running replicate or multivariate experiments. The wall thickness of the glass is 150 microns for compatibility with high numerical aperture immersion objectives.

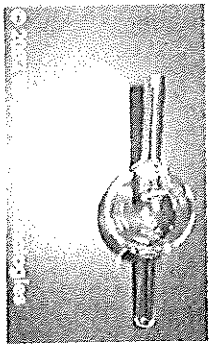


FC93 This flow cell houses four 3 x 3 mm square glass channels. The FC93 can be operated under high shear turbulent flows and has been run at Reynolds numbers in excess of 10,000.

BioSurface Technologies, Corp.

Flow Breaks

The BST Flow Break is designed to prevent bacterial contamination of nutrient reservoirs from the biofilm reactor. The flow break is inserted into the nutrient supply line near the biological reactor and provides an impediment to bacterial growth upstream of the flow break. The flow break is manufactured from borosilicate glass and is completely autoclavable and re-useable.



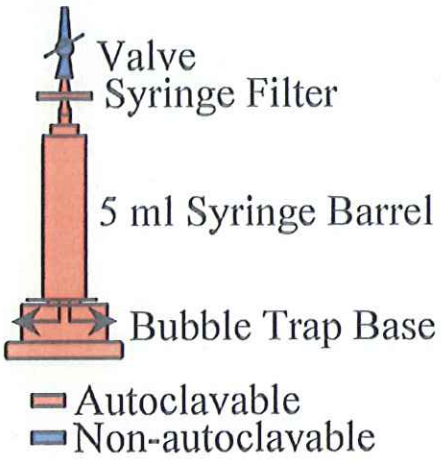
Bubble Traps

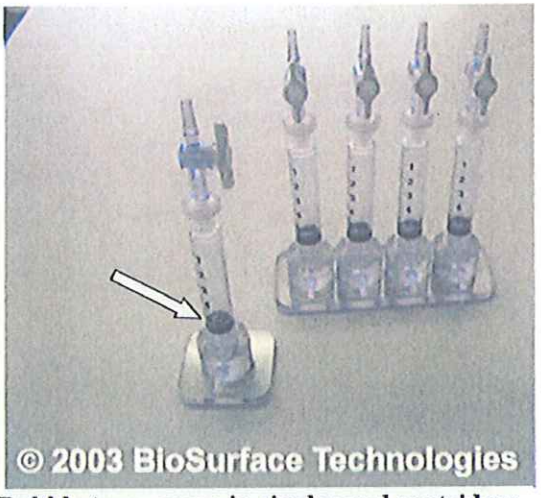
The BST bubble trap is designed to capture gas bubbles before they enter the flow cell. The bubble trap also acts as a pulse damper to reduce pulses in nutrient flow caused by peristaltic pumps.

Autoclaving: The bubble trap base, syringe barrel and filter are autoclavable. The valve is not autoclavable, and should be removed prior to autoclaving. Attach all tubing and the flow cell prior to autoclaving. After removing the barrel, bubble trap base and filter from the autoclave, the valve can be attached to the male luer-lock fitting on the filter. The rubber gasket (shown by the arrow in the photograph) should be replace periodically and is simply made by cutting the center out of the rubber seal which can be removed from the plunger of a 5 ml disposable syringe.

Operations: At the start of the experiment, while liquid is pumped through the bubble trap and flow cell, open the valve to provide a small reservoir of liquid in the syringe barrel (2-3 ml). Turn the valve to the off position. The liquid in the syringe barrel acts as a reservoir to take the place of the captured gas bubbles. The valve can be opened during the experiment to maintain a liquid reservoir in the syringe barrel as needed.

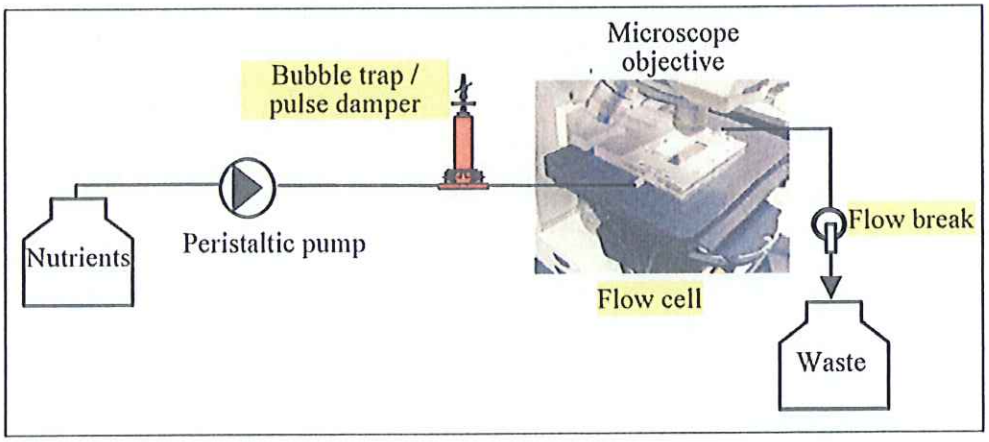
BioSurface Technologies, Corp.





Bubble traps come in singles and cartridges of four.

Typical System Set-Up



This schematic shows the simplest system set-up. In some cases a mixing chamber may be added to provide aeration and temperature control. For high shear flows with the BST FC 93 the flow cell may need to be positioned in a recirculating loop. A flow break may also be inserted in the inlet line to prevent the backgrowth of microorganisms into the nutrient vessel.