

The majority of parts were fabricated by CNC machining. These include the polysulfone fluidic plate and filter supports, the black Delrin covers for pneumatic indicators, the acrylic pneumatic plate and docking station, and the polycarbonate lid for fiber optic oxygen probes. Polystyrene and polycarbonate scaffolds were fabricated by CNC microdrilling. Polypropylene retaining rings, PVDF filters (SVLP09050, Millipore Corp., USA) and silicone membranes for the pneumatic indicators were fabricated by punching, and the polyether aromatic polyurethane membrane (ST-625FS, Stevens Urethane, USA, and MT 2001, American Polyfilm, USA) was cut by laser machining. Solvent bonding was used to seal the pneumatic lines in the pneumatic plate. Sterile polystyrene multiwell lids were purchased from Corning, USA.

Several methods were used for sterilizing the parts. The polyurethane membrane was sterilized using ethylene oxide. The fluidic plate, filter supports, filters, O-rings, and retaining rings were autoclaved. The polycarbonate oxygen sensor lid and polycarbonate scaffolds were soaked in 70% ethanol for 30 minutes. Following ethanol sterilization, scaffolds were rinsed in 1x phosphate buffered saline (PBS) then coated with collagen. After 2 hours in a $30 \mu\text{g mL}^{-1}$ solution of collagen type I (rat tail, BD Biosciences, USA) in 1x PBS, the scaffolds were air-dried in a sterile dish. PVDF filters for the reactor wells were coated in 1% bovine serum albumin (Sigma, USA) in PBS for 30 minutes.

The pneumatic plate and fluidic plate were assembled with screws tightened to 0.12 N m by a power torque driver.