**Laminated thin-film Teflon chips for petrochemical applications**

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**Port Fabrication**

A number of out-of-plane port options are available in the literature.\(^1\),\(^2\),\(^3\) For these chips magnetic connectors worked well for testing at low pressure with non-solvent liquids\(^1\) and mechanical compression fittings were applied for solvents and/or when high temperatures or pressures were required\(^3\). To fabricate the compression fittings an O-ring groove was machined into a 3.2mm (1/8”) thick FEP sheet and a 1mm hole was drilled and tapped into the sheet to allow for the 1mm threaded stainless steel inlet tubing, similar to the method outlined by Chen et al.\(^2\). Compression fittings were assembled by compressing a Viton O-ring between the FEP sheet and the chip’s inlet port using bolted aluminium plates.

**Materials**

The FEP films used were from DuPont 127µm (0.005”), 50.8µm (0.002”) and 25.4µm (0.001”) (McMaster Carr #85905K62, 85905K64, 85905K66 respectively). The PFA films were also from DuPont 127µm (0.005”), 50.8µm (0.002”) and 25.4µm (0.001”) (McMaster Carr #84955K26, 84955K24, 84955K22 respectively). The film was cut using a 30W Universal Laser Systems M-360 CNC laser cutting system. Layers were bonded in a Fisher Scientific Isotemp Model 281A Vacuum Oven (at atmospheric pressure) located in a fume hood to remove gases released during processing of the Teflon. The viscosity of the 80% toluene mixture was verified using a cone and plate rheometer, Advanced Rheometer AR2000, with a 60 mm 0.5º cone. Heavy oil samples were obtained from Suncor. ACS reagent grade ≥99.5% toluene from Sigma-Aldrich was used.

**References**