Appendix A. Calculating the Oil Swelling Factor

The following calculations of the oil swelling factor were made to find the volume percentage of oil in an HPHT cell.
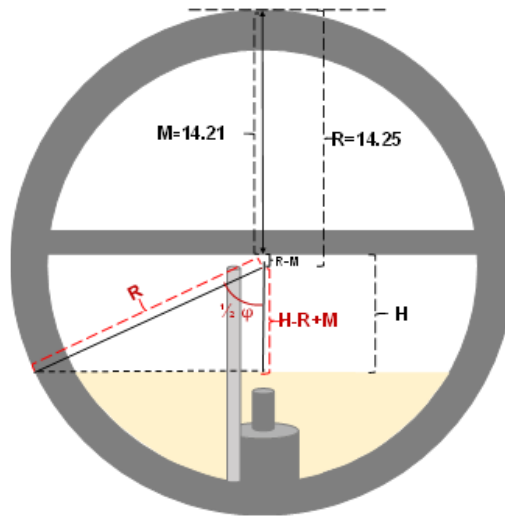

Figure A-1: Schematic for oil swelling calculation.

$$\cos\left(\frac{\varphi}{2}\right) = \frac{\text{H-R+M}}{\text{R}} \tag{A-1}$$

$$\varphi = 2\arccos\left(\frac{\text{H-R+M}}{\text{R}}\right) = 2\arccos\left(\frac{\text{H-0.04}}{14.25}\right) \tag{A-2}$$

$$S_{liq} = \pi R^2 * \frac{\varphi}{360°} - R\sin\left(\frac{\varphi}{2}\right) * (H - R + M) \tag{A-3}$$

$$\eta_{sw} = \frac{S}{S_{in}} = \frac{V}{V_{in}} \ , \tag{A-4}$$

where φ is the angle of oil fan, H is the distance between the oil level and the lower part of the capillary metal holder, R is the known radius of the circular area of the HPHT cell (i.e., 14.25 mm), M is the known distance from the upper part of the capillary metal holder to the top of the HPHT cell (i.e., 14.21 mm), S is the cross-section of the oil phase at experimental conditions, S_{in} is the cross-section of the oil phase prior to gas injection, and η_{sw} is the swelling coefficient.

Appendix B. Results of Testing for Reproducibility of the Experimental Results

This appendix presents IFT results using capillary rise technique. Experiment ID's 4 and 6 were repeated for pure C_{10} oil; and 1 and 3 were repeated for C_6-C_{10} mixture oil. These runs indicate good reproducibility.

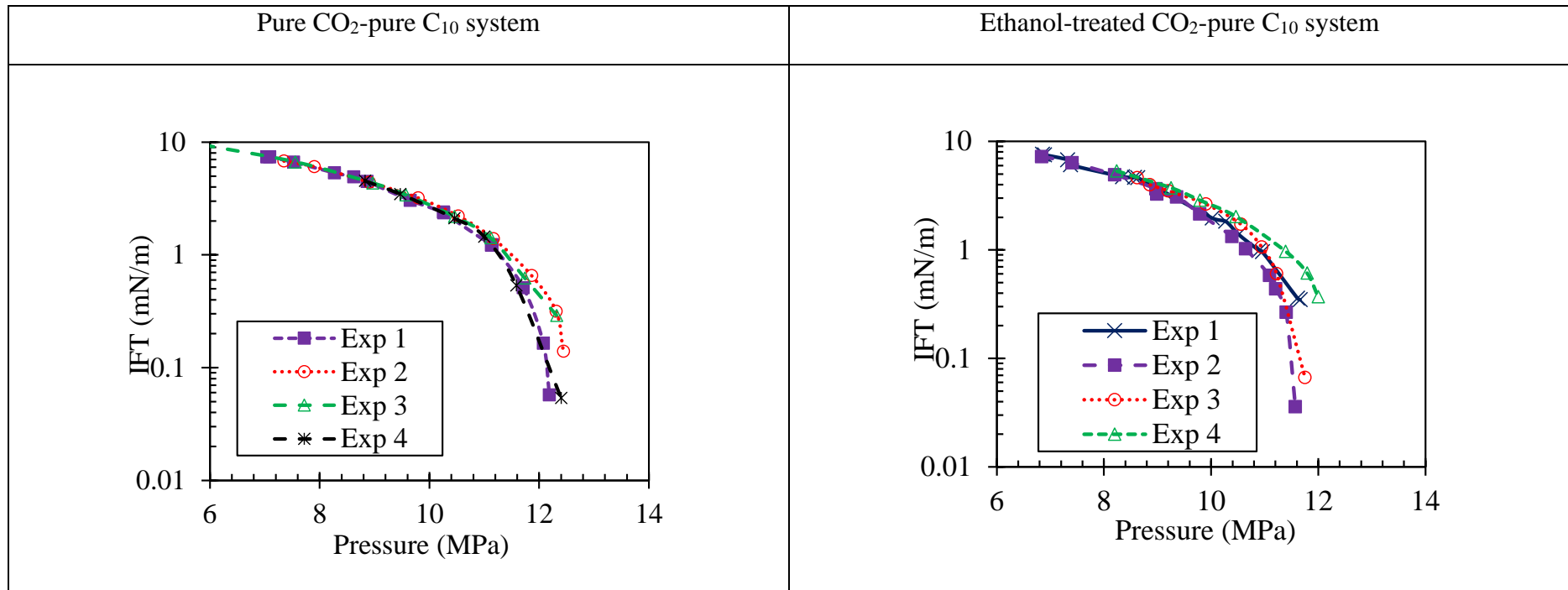| Pure CO_2-pure C_{10} system	Ethanol-treated CO_2-pure C_{10} system

Figure B-1: IFT measurement using the capillary rise technique for (a) the pure CO₂-oil system, and (b) the ethanol-treated CO₂-oil system, both involving pure C₁₀.
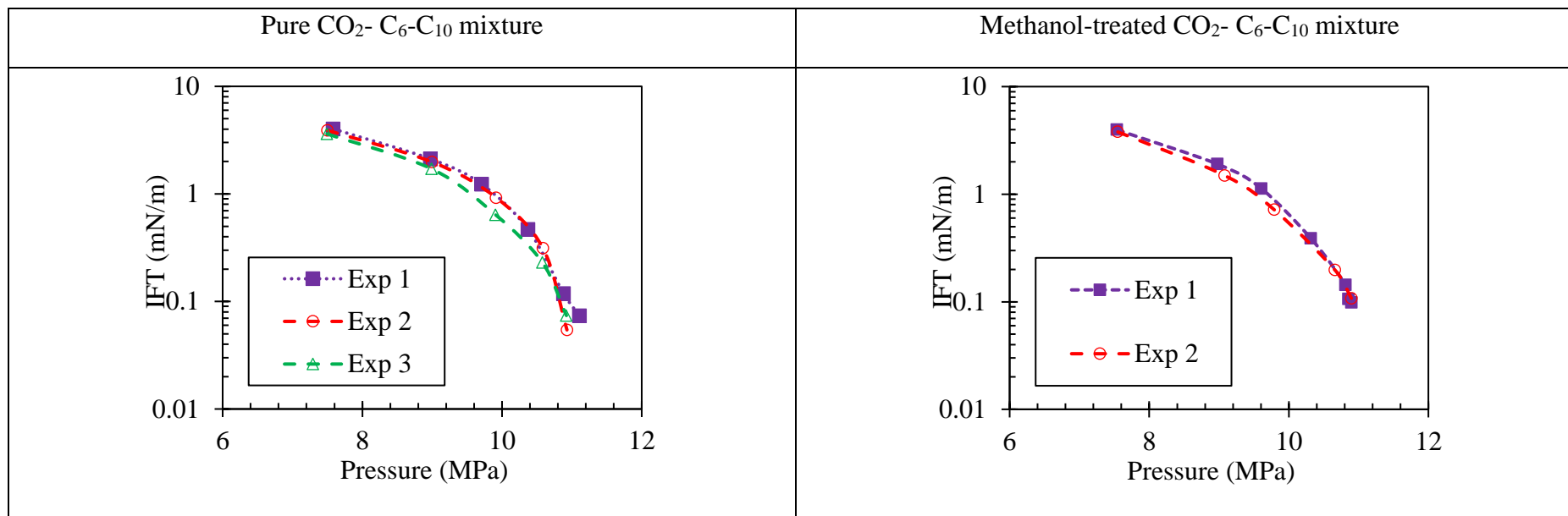
Figure B-2: IFT measurement using the capillary rise technique for (a) the pure CO_2-oil system, and (b) the methanol-treated CO_2-oil system, both involving the C_6-C_{10} mixture.

Appendix C. Calculation of Error in IFT Calculation

The error in IFT calculation caused by ignoring the composition-dependent densities is depicted in the figure below.
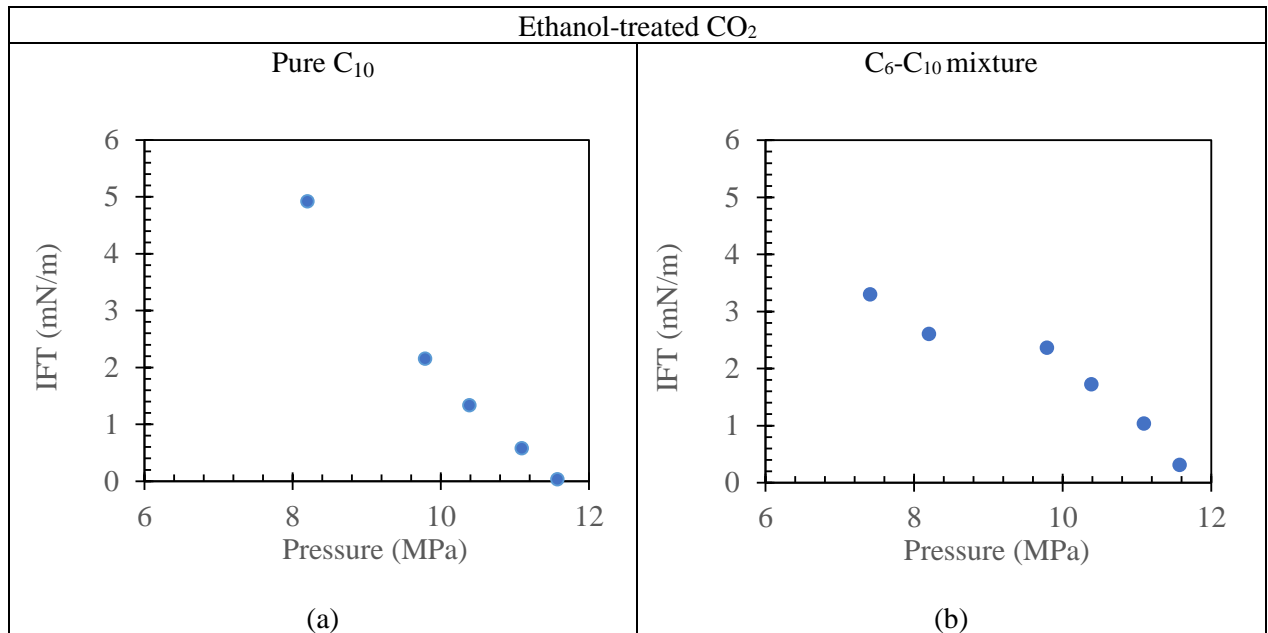

Figure C-1: Error bars for density difference for experimental runs of ethanol-treated CO_2 using (a) pure C_{10}, and (b) the C_6-C_{10} mixture.