

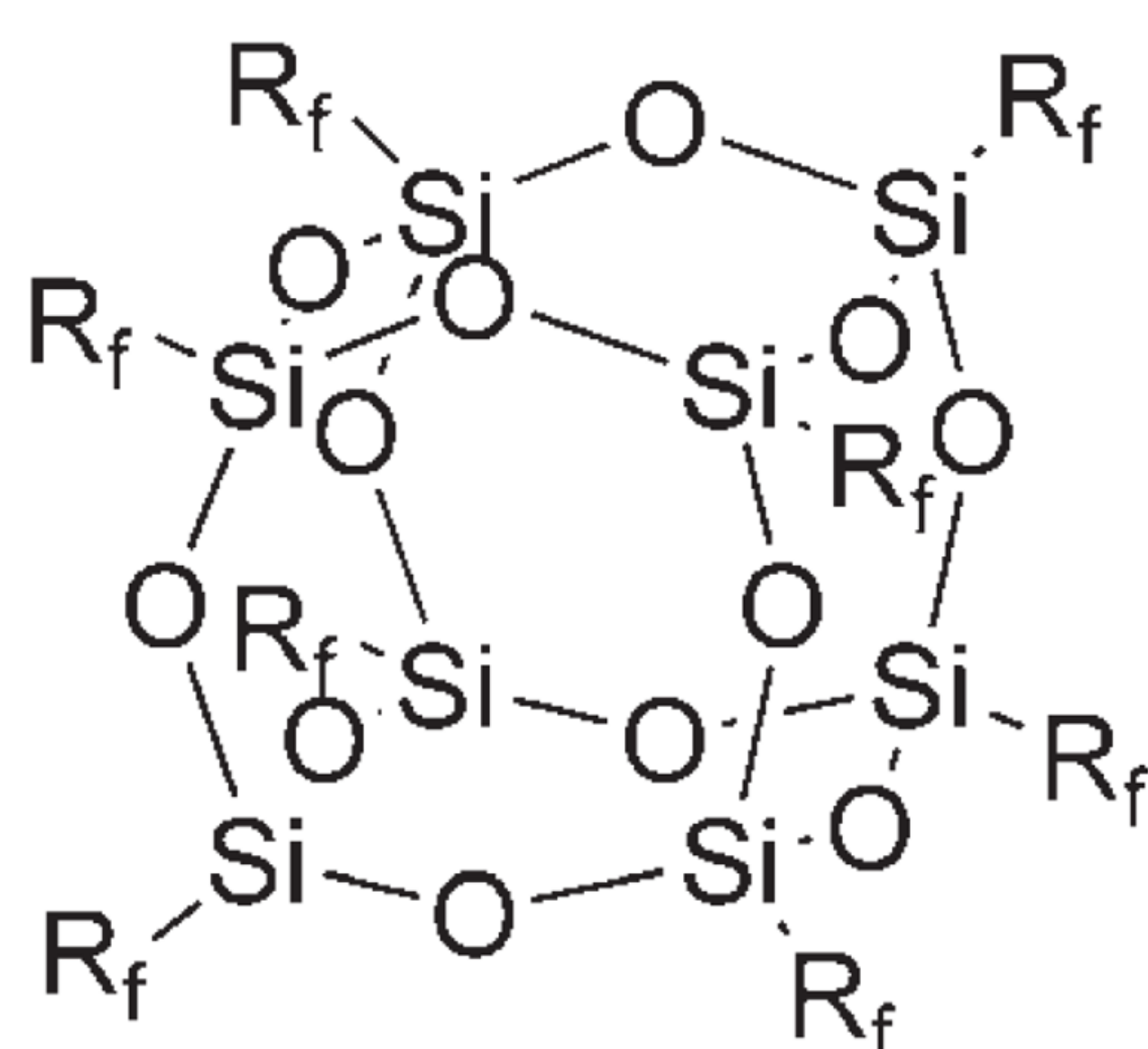
Background

POSS compounds have applications as hydrophobic coatings. However, in order to be deposited on surfaces, it must first be dissolved. Previous work by Scott Lacona et. al. at the United States Air Force Academy shows that Fomblin Y should dissolve POSS. Additionally, Fomblin Y is theoretically able to control crystallization of POSS. Controlling the crystallization of POSS can increase the hydrophobicity of the coating. Instrumental analysis is necessary to know if Fomblin Y truly dissolves POSS.

Question

Are various fluorinated POSS compounds soluble in Fomblin Y? How does this vary with temperature?

POSS Compounds tested



FH $R_f = \text{CH}_2\text{CH}_2\text{CF}_2\text{CF}_2\text{CF}_2\text{CF}_3$
 FO $\text{CH}_2\text{CH}_2\text{CF}_2\text{CF}_2\text{CF}_2\text{CF}_2\text{CF}_2\text{CF}_3$
 FD $\text{CH}_2\text{CH}_2\text{CF}_2\text{CF}_2\text{CF}_2\text{CF}_2\text{CF}_2\text{CF}_2\text{CF}_2\text{CF}_3$

Figure 1: Three different Fluoro Poss compounds were tested: Fluoro Hexyl, Fluoro Octyl, and Fluoro Decyl POSS

Solvent Tested

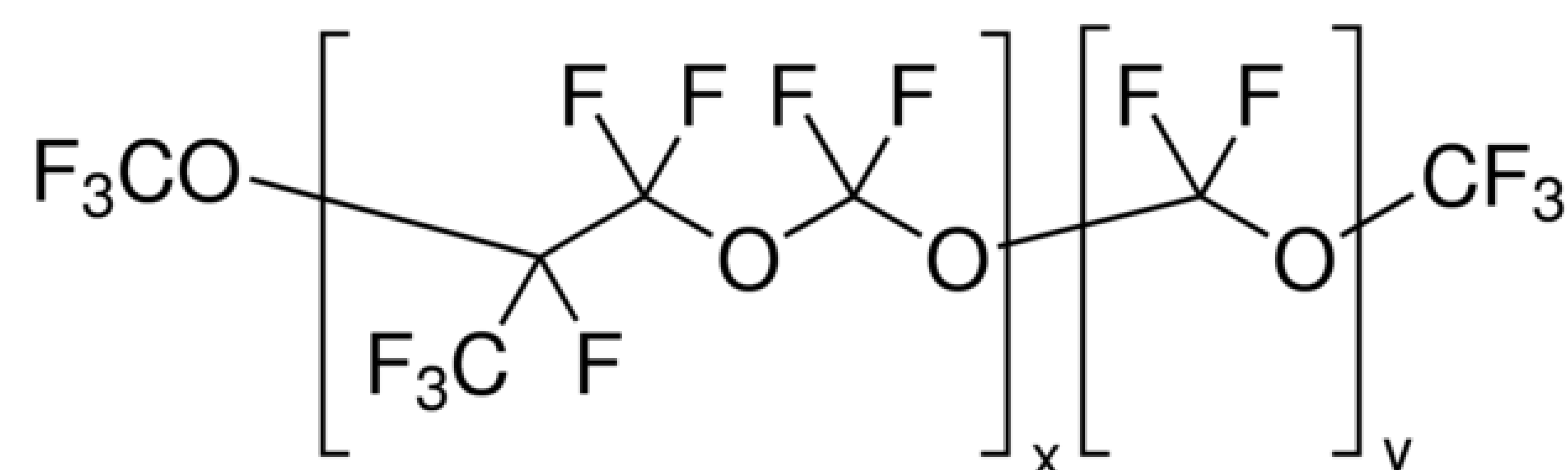
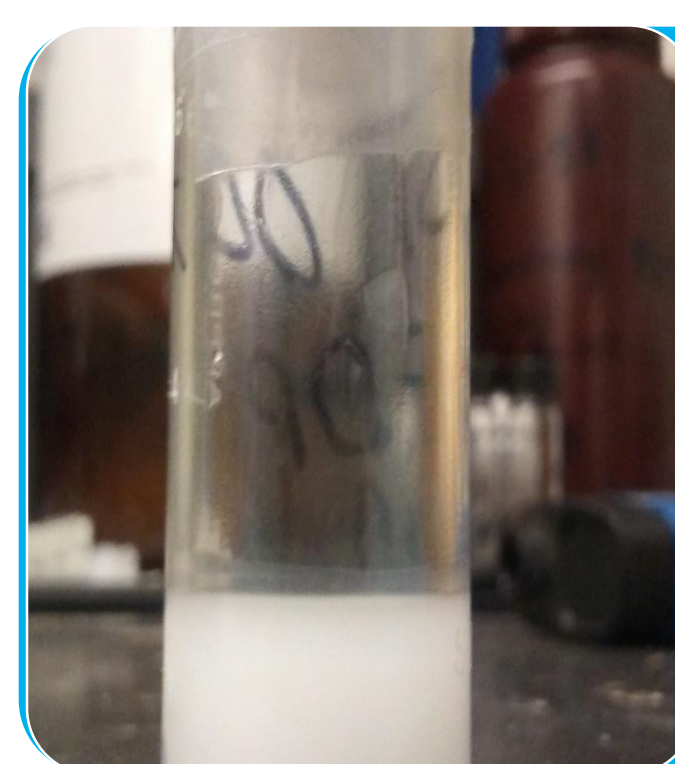


Figure 2: Fomblin Y is a long fluorinated ether chain. It's fluorination makes it (theoretically) able to dissolve Fluoro POSS compounds. Earlier visual experiments appear to confirm this. However, testing of light scattering vs. temperature is necessary to confirm our predictions.

Procedure

Step 1



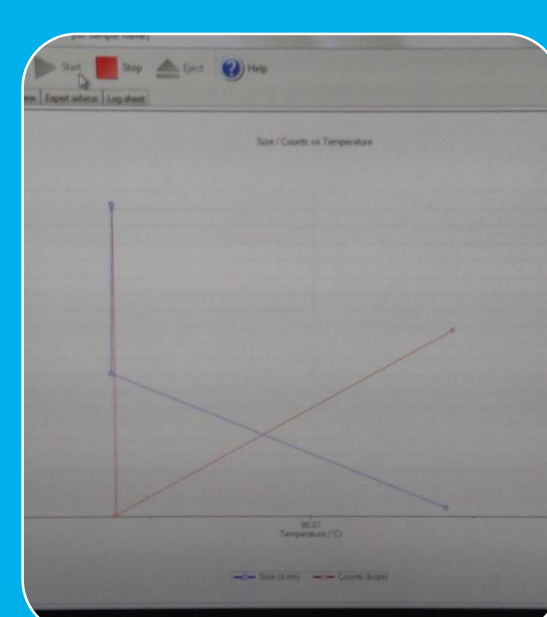
A saturated solution was made of Fluoro POSS in Fomblin Y, forming a cloudy suspension.

Step 2



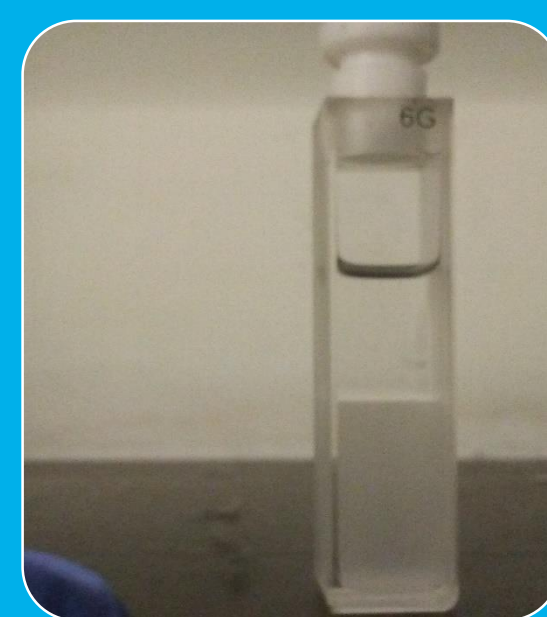
The Sample was placed into a Malvern Zetasizer. This instrument measures how cloudy the solution is using light scattering.

Step 3



The Zetasizer fluctuated the temperature. As the POSS dissolved, the solution became less cloudy and "count rate" decreased.

Step 4



Solution was diluted and the procedure was repeated.

Funding for this Work Thanks To



Results

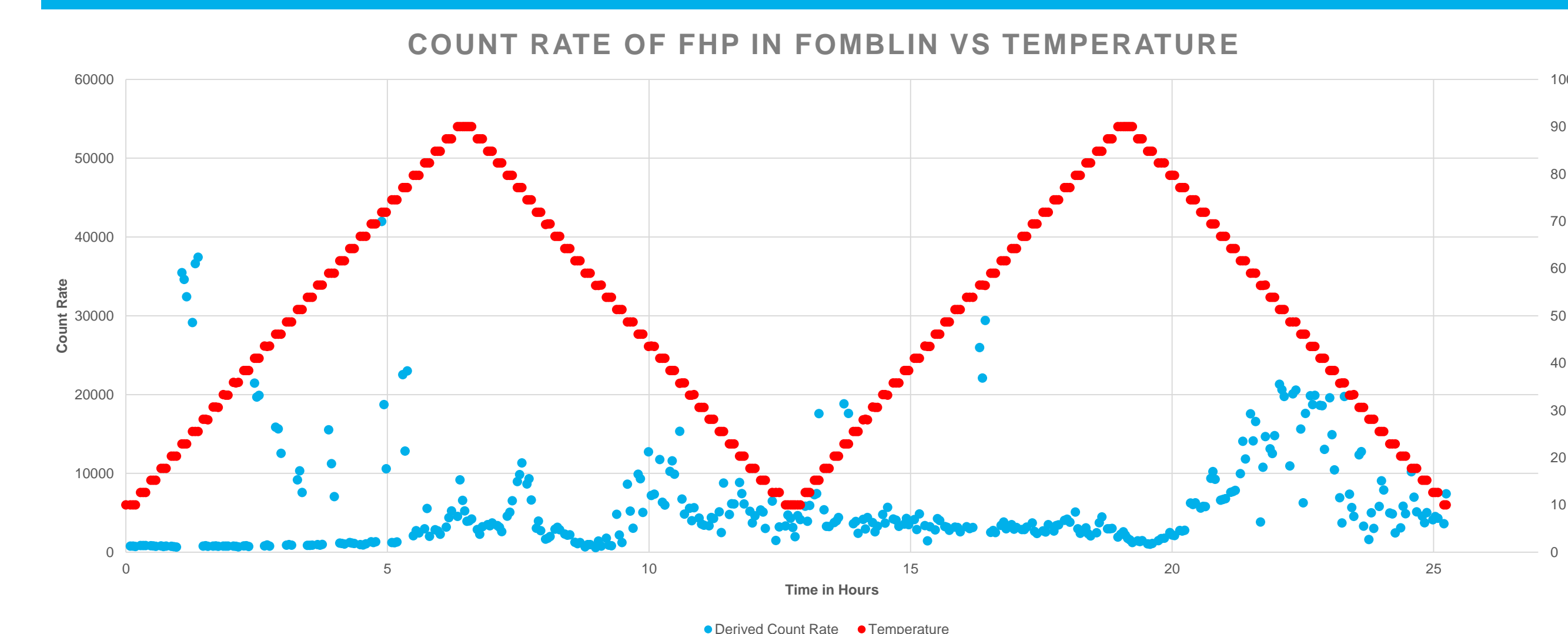


Figure 3: Fluoro Hexyl POSS showed a weak correlation between temperature and solubility, with a great amount of noise.

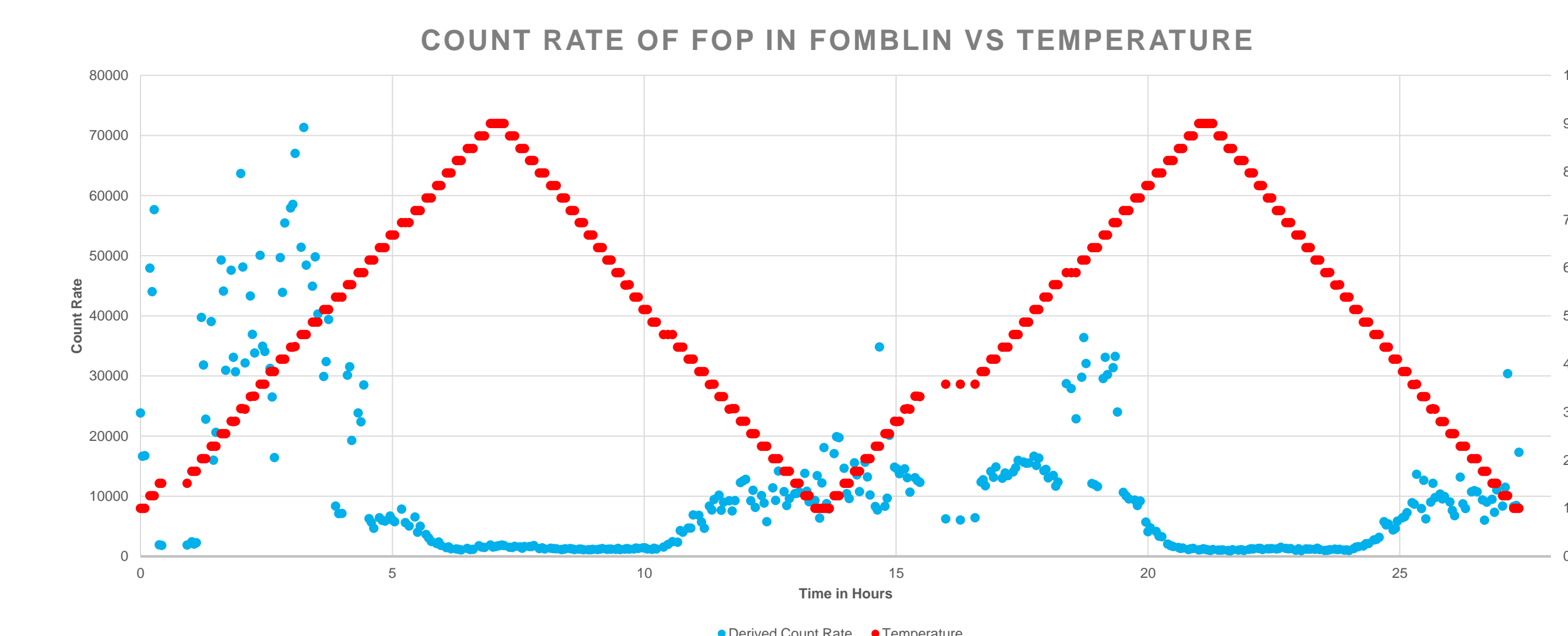


Figure 4: Fluoro Octyl POSS showed a stronger solubility correlation with temperature

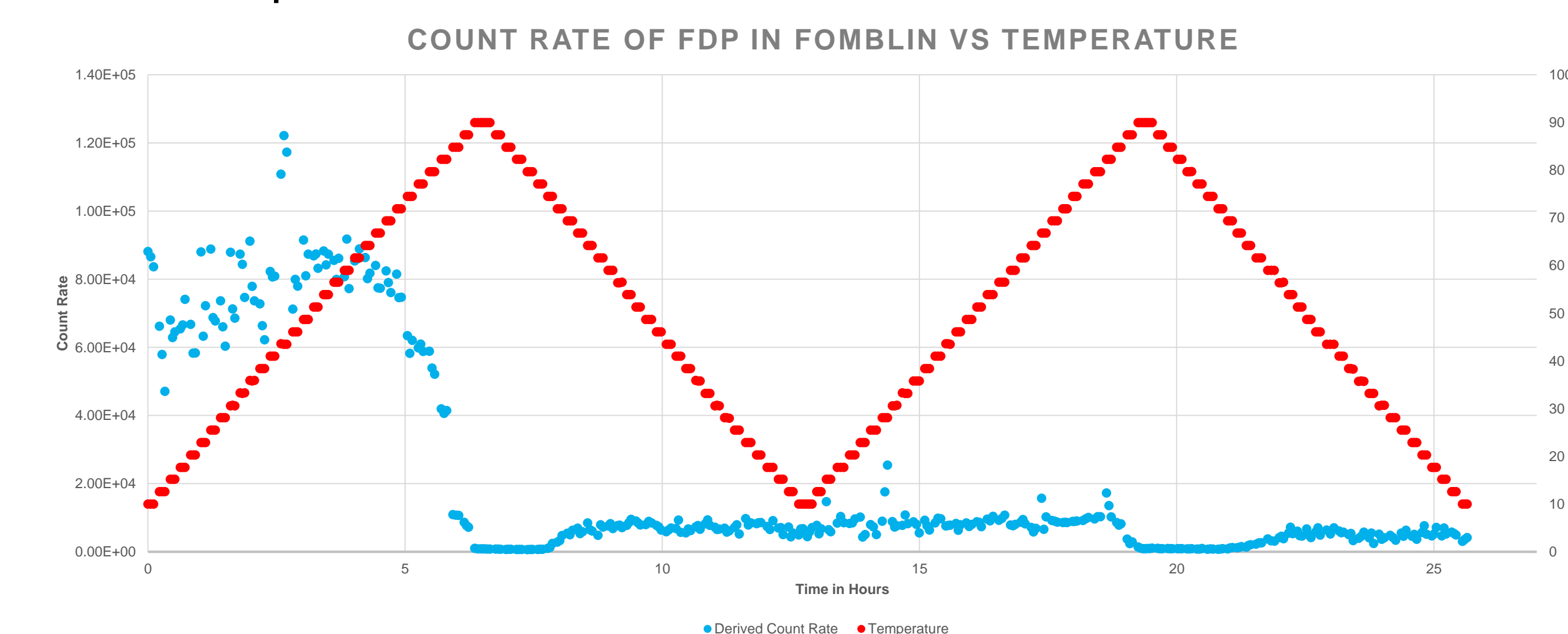


Figure 5: Fluoro Decyl POSS showed a strong solubility correlation with temperature, although it appears the solution stayed super saturated

Conclusions and Future Work

Because the count rates are going to zero with increased temperature, we know that these POSS compounds are indeed soluble in Fomblin Y. Future work will test to see if Fomblin Y is indeed able to control crystallization of POSS compounds.