# Supplementary information

# for

## Investigation on modified polyether as efficient $CO_2$ thickener

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**Esterification of the hydroxyl end group of polyether.** A large excess of acetyl chloride was used in all cases to ensure a complete reaction. In a typical experiment, 17.05 g (10 mmol -OH) PSAGEGPEAc and 4.13 g (40.8 mmol) triethylamine were dissolved into 100 mL anhydrous toluene under nitrogen atmosphere and then 3.14 g (40 mmol) acetyl chloride was slowly dropped into the mixture at ice-water bath. After keeping the mixture react overnight at room temperature, the mixture was filtered and the filtrate was washed with aqueous solution of $NaHCO_3$, then dried and distilled under vacuum, thus obtained the desired product of PSAGEGPEAc (a colorless or light yellow viscous liquid with a yield of 91%).

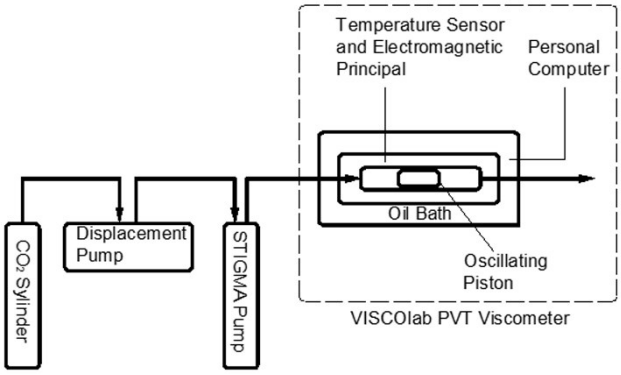


**Fig. S1 Viscosity measurement setup of polymer thickened $CO_2$**

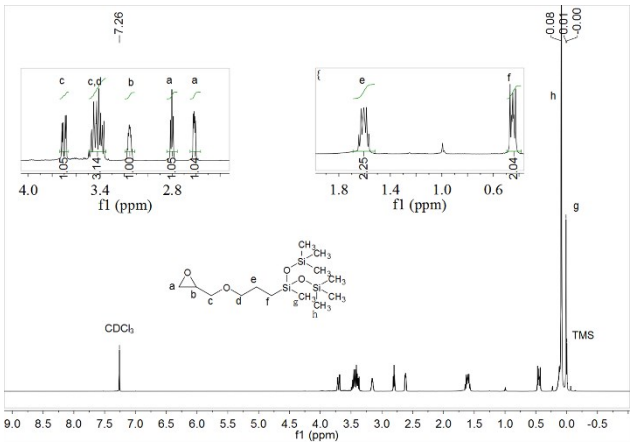


**Fig. S2 $^{1}$H NMR spectrum of SAGE.**

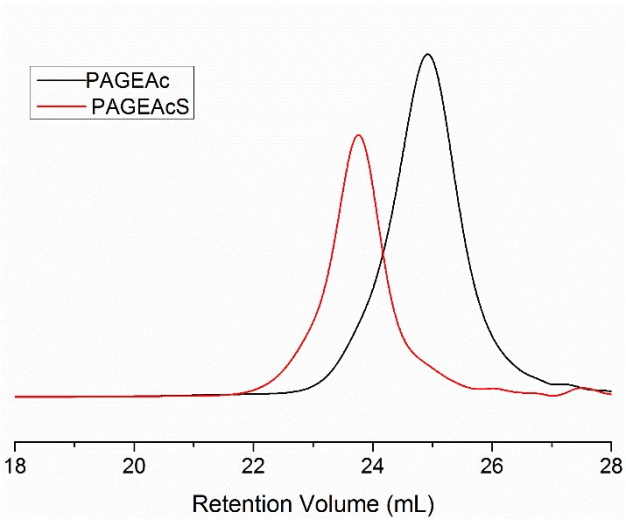


**Fig. S3 GPC spectra of PAGEAc and PAGEAcS.**

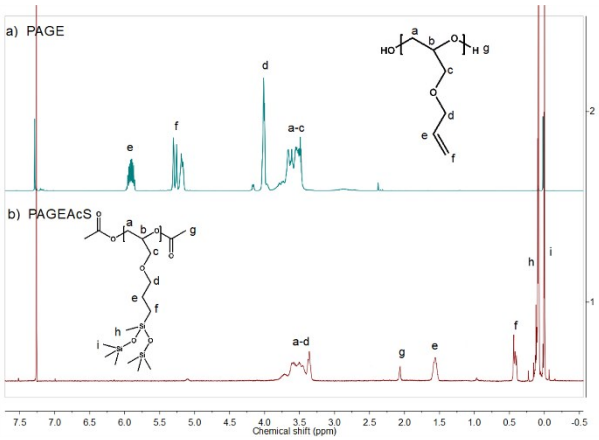


**Fig. S4 $^{1}$H NMR spectra of PAGE and PAGEAcS**