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Electronic Supplementary Information (ESI)

Biodegradable polyethylene glycol-based ionic liquids for effective inhibition of shale hydration

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^{1}H NMR spectra

^{1}H NMR spectra of ILs PMI200, PMT200, PSI200 and PST200 are shown in Fig. S1. For PMI200, the chemical shifts at 3.65, 6.84, 7.01, and 7.50 ppm are assigned to the protons of 1-methylimidazole. The protons of double bond were observed at 5.13-5.17 ppm. And the 3.54-3.61 ppm and 3.86-3.89 ppm are ascribed to the protons of $–CH_2–CH_2–O–$ in PEG chains. For PMT200, the chemical shifts at 1.31-1.35 ppm and 3.11-3.17 ppm are attribute to the protons of methyl and methylene in triethylamine. The chemical shifts of the protons located in double bond are 5.89-5.92 ppm and 6.46-6.49 ppm. The observed chemical shifts at 3.65-3.78 ppm and 4.26-6.28 ppm are ascribed to $–CH_2–CH_2–$ of PEG skeleton. For PSI200, the chemical shifts at 3.74, 6.93, 7.11, and 7.81 ppm are due to the proton of 1-methylimidazole. The proton signals of $−OOC−CH_2−CH_2–COO−$ are at 2.62-2.64 ppm. The chemical shifts of protons of $−CH_2−CH_2–O−$ in the main chain of PEG are observed at 3.65-3.71 ppm and 4.24-4.25 ppm. For PST200, the protons chemical shifts of methyl and methylene in triethylamine are at 1.23-1.27 ppm and 3.05-3.11 ppm, and chemical shift at 2.55-2.63 ppm is due to the protons $−OOC−CH_2−CH_2–COO−$. And the observed proton signals of PEG skeleton are 3.62-3.68 ppm and 4.20-4.21 ppm.

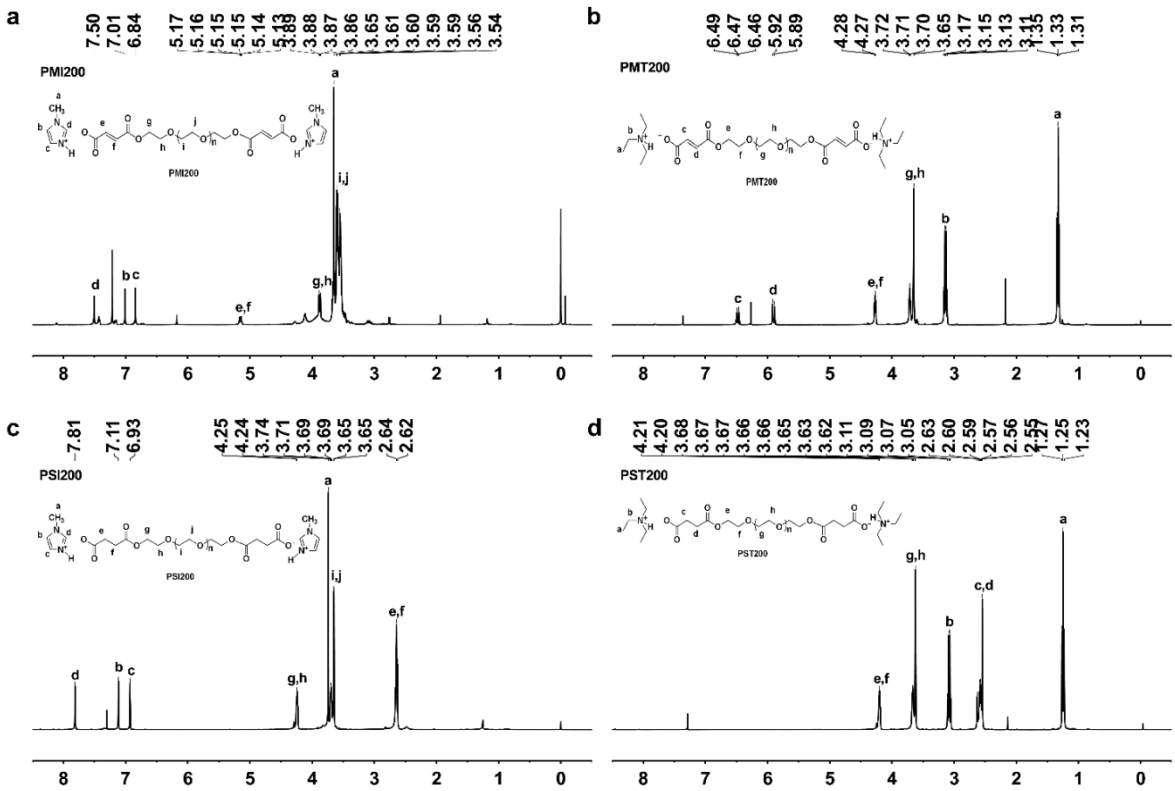

Fig. S1 ^{1}H NMR spectra of (a) PMI200, (b) PMT200, (c) PSI200 and (d) PST200.