Supplementary information:

Determination of polysulfide anions and molecular sulfur via coupling HPLC with ICP-MS

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SI tables and figures

R–X	derivatization	UV-Vis peaks after chromatographic separation
CH_3–OTf	fast	present
$C_6H_5CH_2$–Cl	slow	present
$(CH_3)_2N$-C_6H_5-CO–Cl	fast	present with double peaks
$C_6H_5SO_2$–Cl	not observed	not observed

Table S1: Qualitative description of derivatization with several derivatizing agents. Derivatization efficiency was described by the loss of the color of the polysulfide mixture

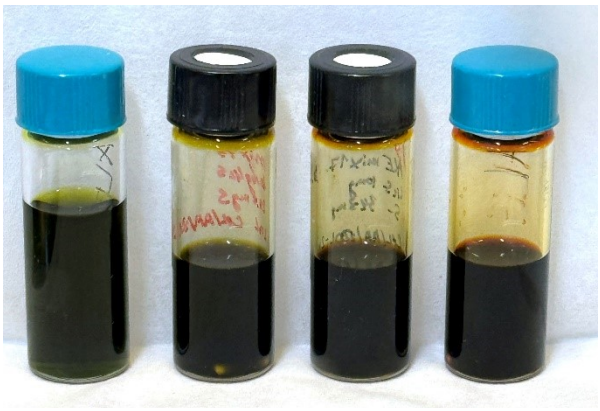

Fig. S1: Photo of 0.11 M lithium polysulfide samples in the mixed solvent (ε-caprolactam : acetamide : 1,3-dioxolane = 1:1:3 wt.). From left to right: Li_2S_4, Li_2S_5, Li_2S_6, Li_2S_8.

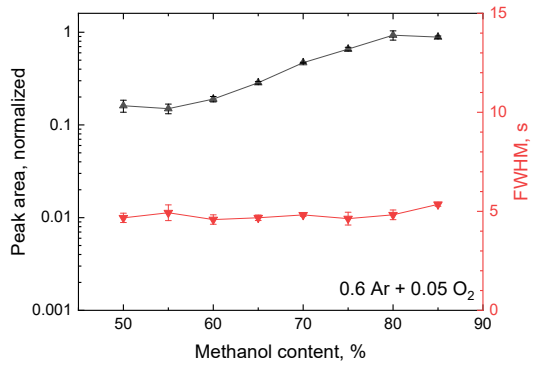

Fig. S2: Signal response measured as peak area and normalized to the maximal value for different methanol contents and peak width over methanol content for Ar-O_2 gas mixture (0.65 L min^{-1} and 0.05 L min^{-1}, correspondingly).

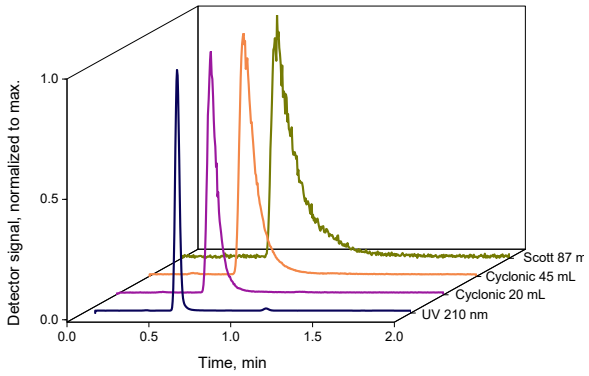

Fig. S3. HPLC-ICP-MS chromatograms of Me_2S acquired using different spray chambers, UV signal at 210 nm shown for comparison. Measurements were conducted using eluent flow of 0.5 mL min^{-1} and sample gas flow of 0.7 L min^{-1} with 55 % (v/v) methanol-water mixture as eluent. Different spray chambers were compared:

- Borosilicate cyclonic spray chamber (20 mL)
- Cyclonic quartz spray chamber (45 mL)
- Quartz double pass spray chamber (87 mL)

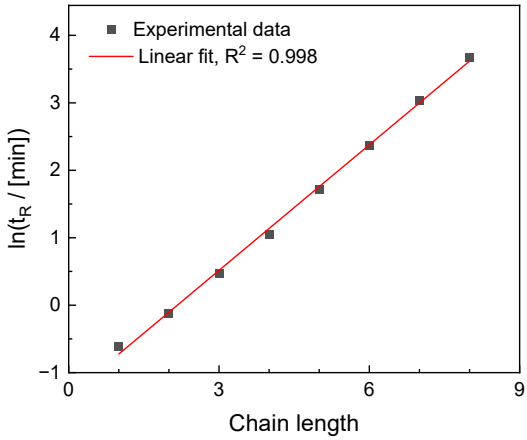

Fig. S4: $ln(t_R)$ versus chain length of the observed chromatography peaks of dimethyl polysulfides.