

## Electronic Supplementary Information

### Insight into the oil removal mechanism of quaternary ammonium ionic liquids microemulsion for oily sludge treatment†

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#### Drawing of ternary phase diagram

The ternary phase diagram was drawn as follows. Firstly, a series of mixtures of n-Hexane and water with different mass

ratios were prepared, and a certain mass of [N<sub>1,1,16</sub>EtOH]Cl were added to them. Then, ethylene glycol was added dropwise and the mass of ethylene glycol was recorded when the solution changed from cloudy to clear and back to cloudy again. The percentage data about them were used to draw the phase diagram (Figure S1).

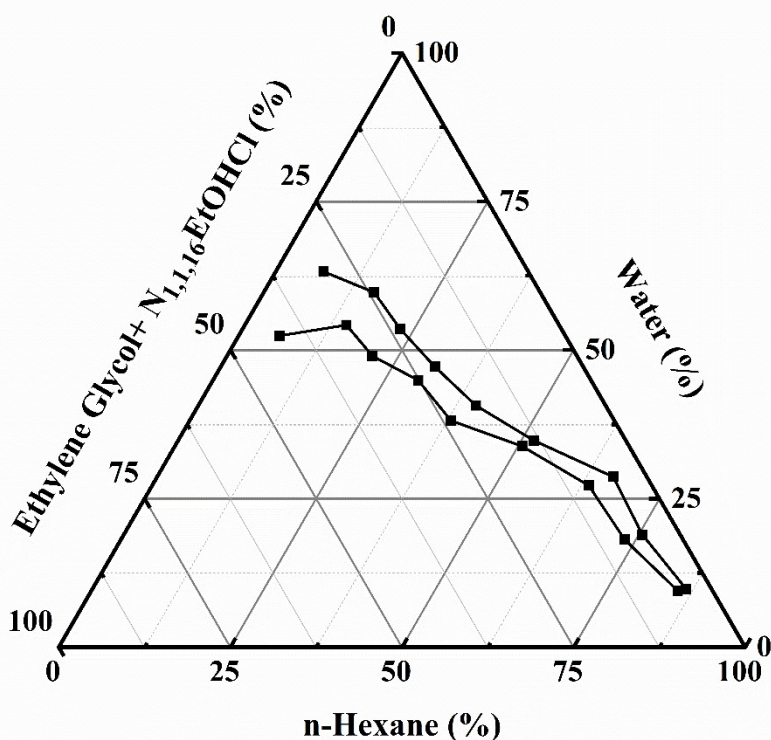


Figure S1 Pseudo-ternary phase diagrams of ethylene glycol-[N<sub>1,1,16</sub>EtOH]Cl /n-hexane/H<sub>2</sub>O oil-in-water microemulsion.

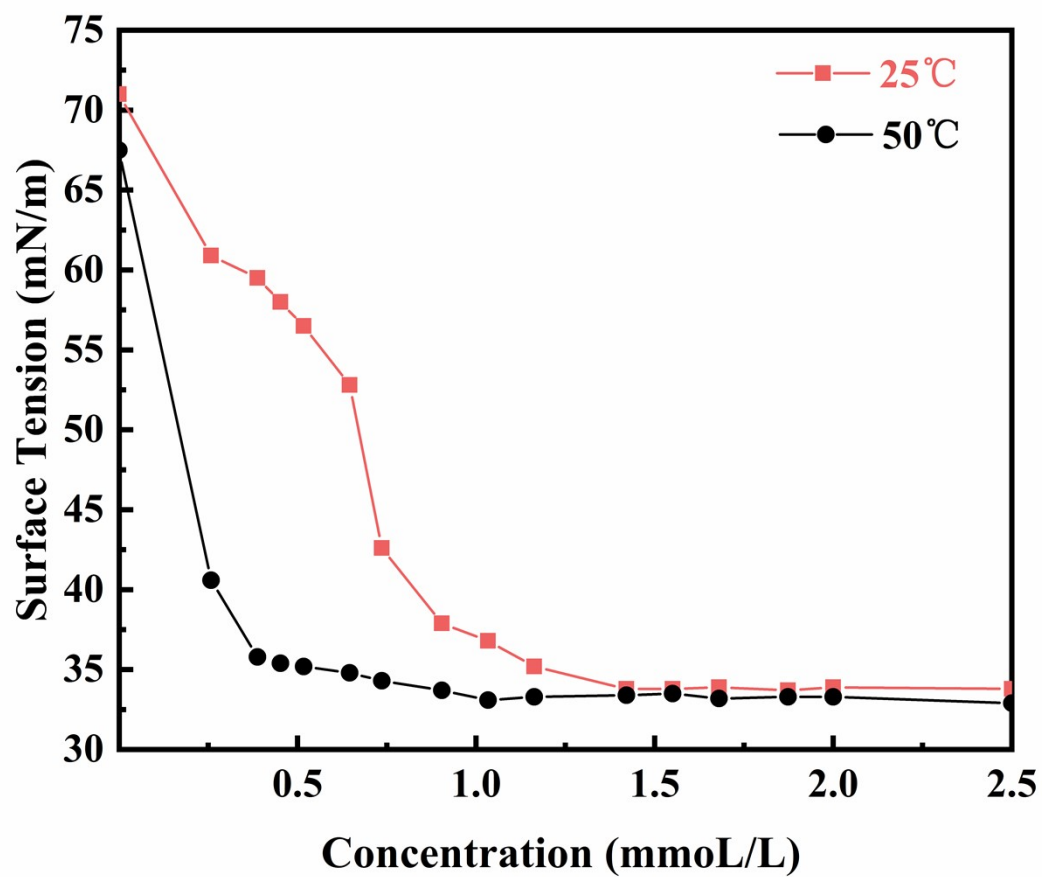


Figure S2 Surface tension of  $[N_{1,1,16}EtOH]Cl$  with different concentrations.

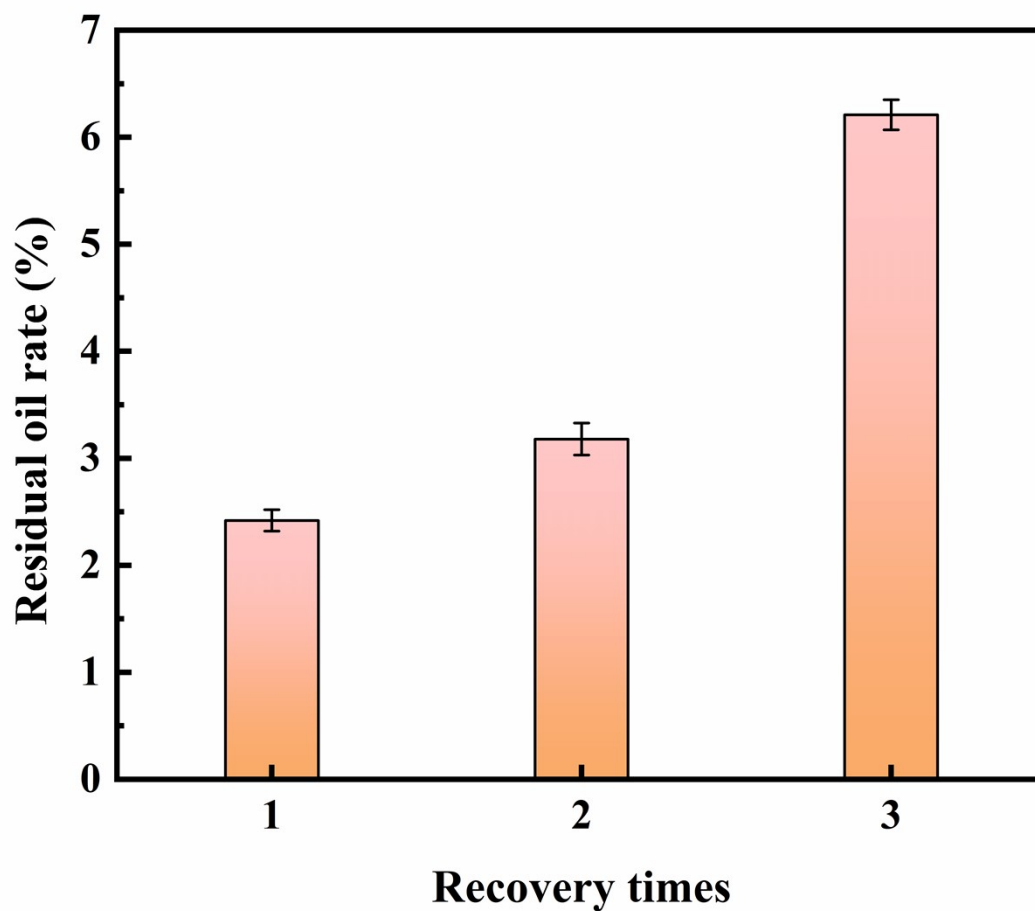
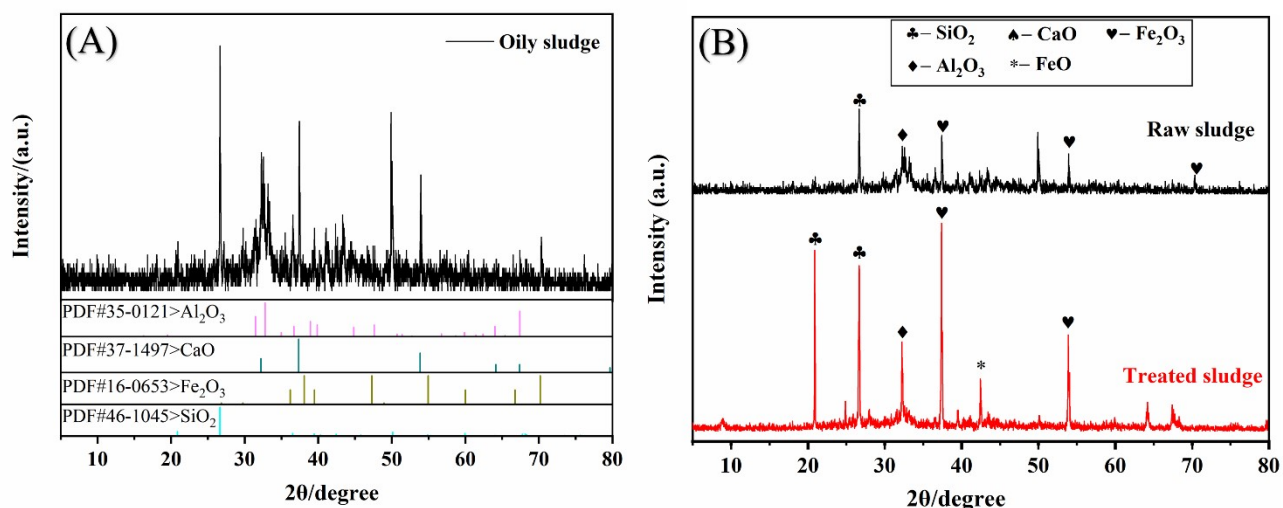
Figure S3 Washing cycles on residual oil rate with  $[N_{1,1,16}EtOH]Cl$  microemulsion.

Figure S4 XRD of oily sludge (A) and the sludge before and after treatment (B).

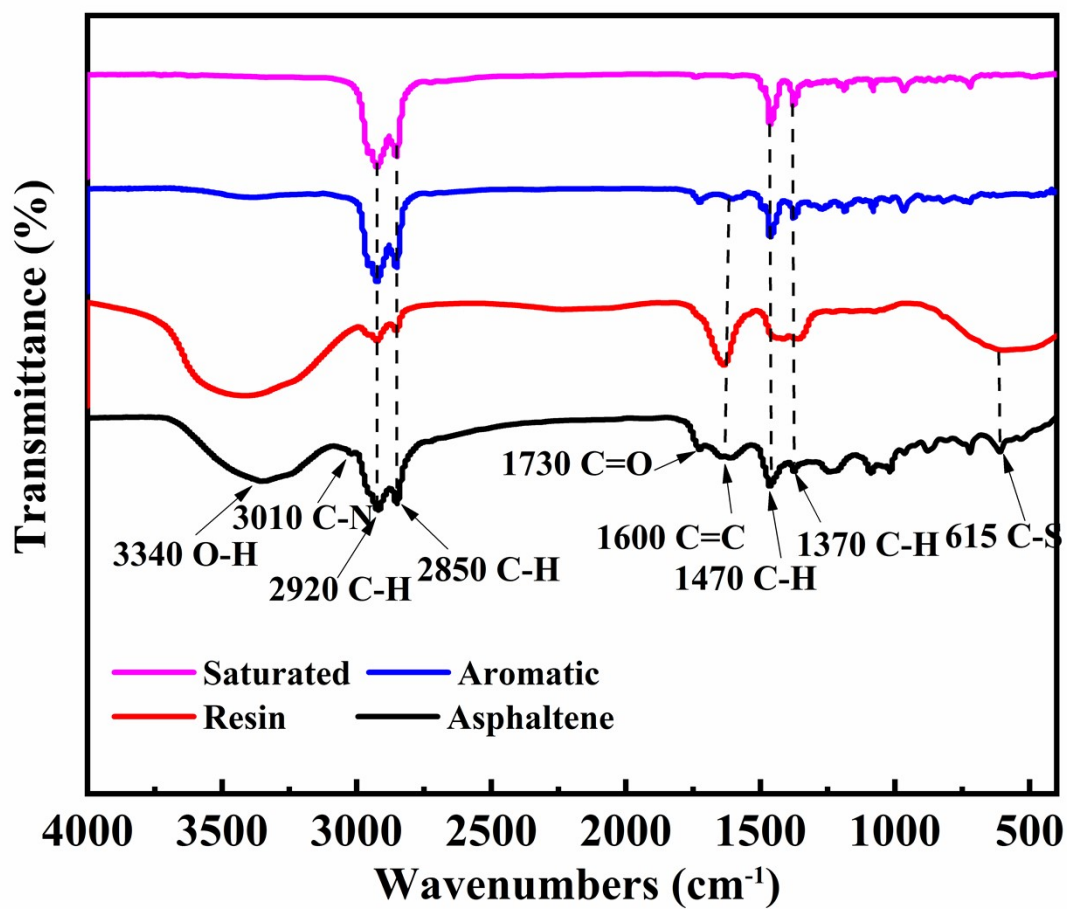


Figure S5 FTIR spectrum of SARA.

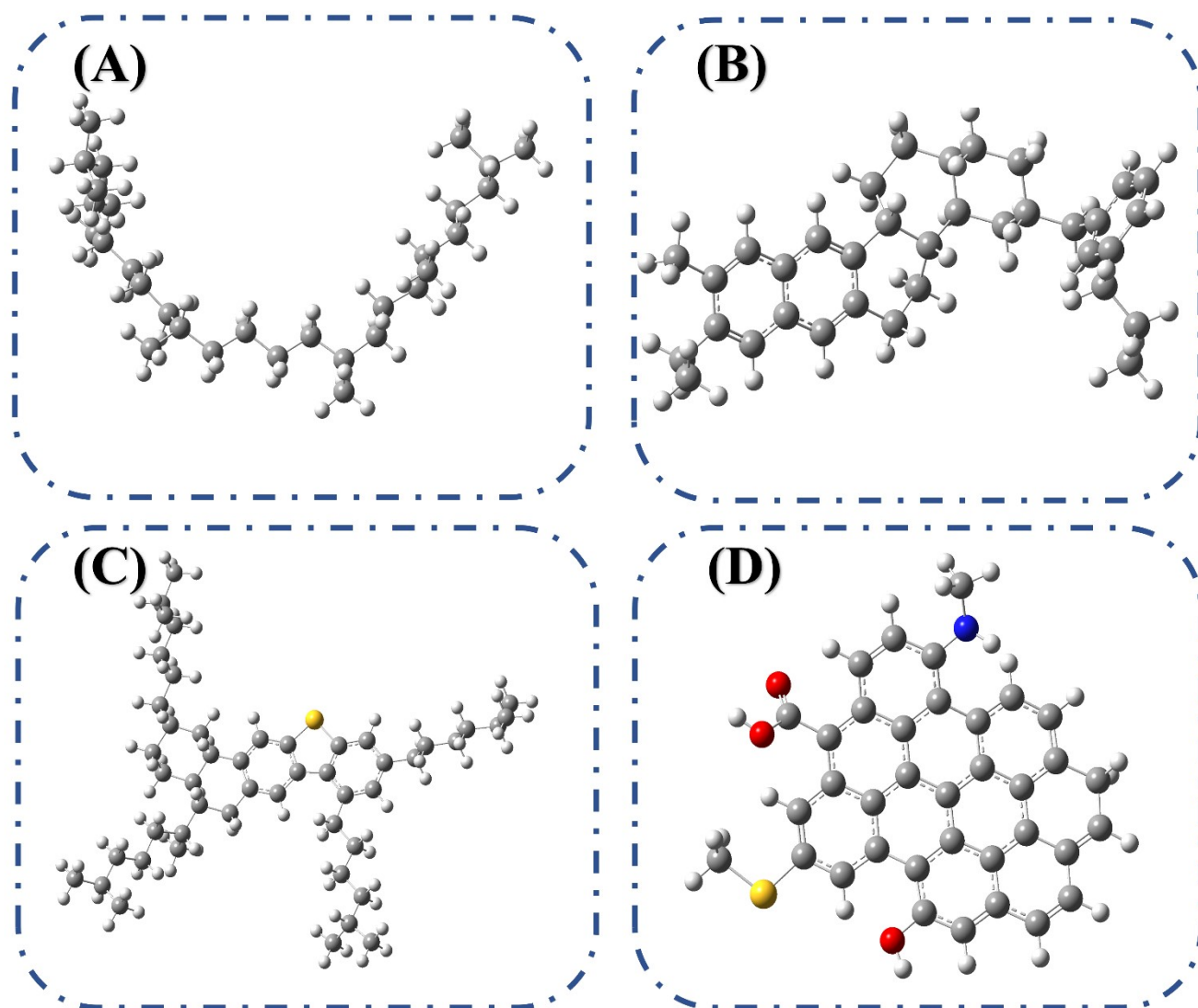


Figure S6 Optimised geometry of saturates (A), aromatics (B), resins (C) and asphaltenes (D).