Imidazoline-Based Fatty Acid Derivatives as Novel Shale Inhibitors for Water-Based Drilling Fluids

Ioana Gabriela Stan [1], Mihail Tudose [1], Alina Petronela Prundurel [1], Gheorghe Branoiu [1], Liviu Dumitrache [1], Silvian Suditu [1], Doru Bogdan Stoica [1,*], Emil Zaharia [2] and Rami Doukeh [1,*]

[1] Well Drilling, Extraction and Transport of Hydrocarbons Department, Petroleum-Gas University of Ploiesti, 100680 Ploiesti, Romania; gabriela.stan@upg-ploiesti.ro (I.G.S.); mihai_tud@yahoo.com (M.T.); alina.prundurel@upg-ploiesti.ro (A.P.P.); gheorghe.branoiu@upg-ploiesti.ro (G.B.); liviu.dumitrache@upg-ploiesti.ro (L.D.); ssuditu@upg-ploiesti.ro (S.S.)

[2] Atica Chemicals SRL, 202 Căzănești Str., 240414 Râmnicu Vâlcea, Romania; emil_zaharia@aticachemicals.ro

* Correspondence: dstoica@upg-ploiesti.ro (D.B.S.); rami.doukeh@upg-ploiesti.ro (R.D.)

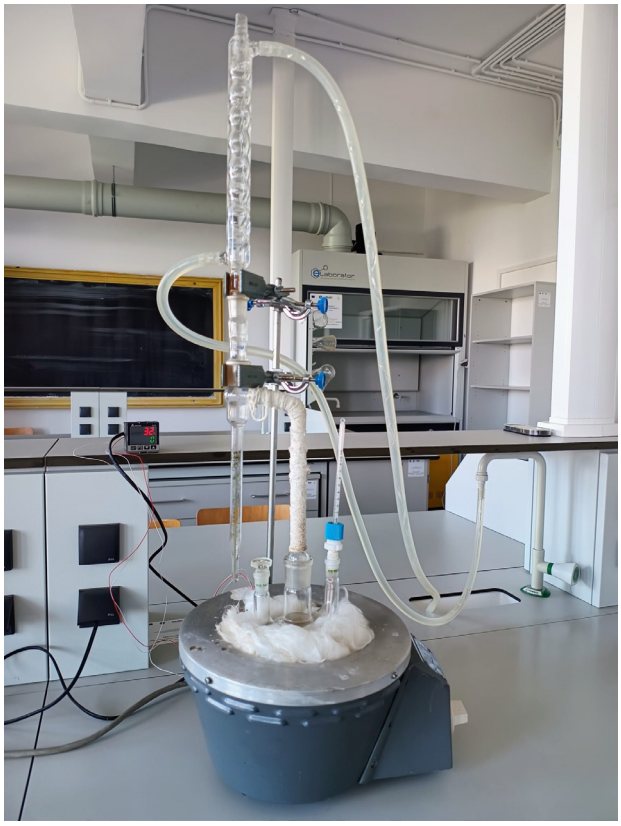


Figure S1. Experimental setup for the synthesis of anti-swelling imidazoline derivatives (A-Lin and A-Lau) via amidation and cyclization with diethylenetriamine (DETA).



Figure S2. Experimental setup for the synthesis and FTIR analysis of anti-edema additives using the Shimadzu IRAffinity-1S spectrometer (Kyoto, Japan), equipped with a GladiATR-10 accessory (PIKE Technologies).

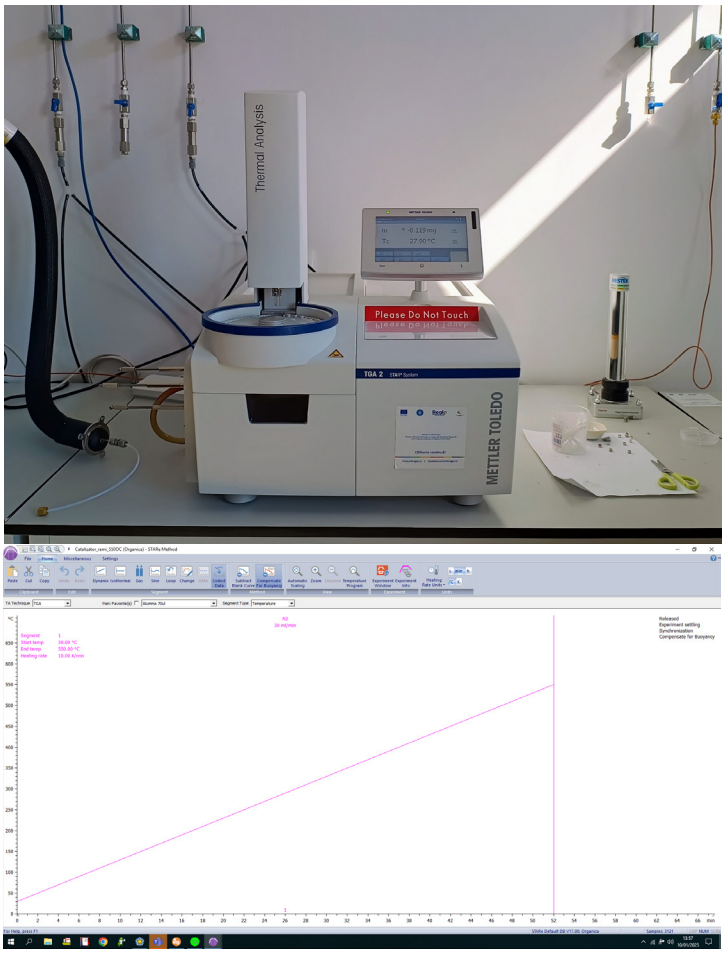


Figure S3. Experimental setup for thermal stability analysis using the METTLER TOLEDO TGA/IST system (Greifensee, Switzerland), equipped with a nitrogen flow controller (30 mL/min). The instrument software interface showing the programmed heating profile is also presented.