

GENERATION OF H₂S ,CO₂ AND ORGANOSULFURED COMPOUNDS PRESENT IN THERMAL RECOVERY PROCESSES IN OIL SANDS, ORINOCO BELT VENEZUELA

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The processes of thermal recovery (IAV, ICV, SAGD, among others) lead to aquathermolysis reactions occurring predominantly between 200 ° C and the range of 300-350 ° C, (Clark and Hyne ,1984), the concentrations of sulfur obtained in crude oil samples (3.05-4.37%) and API (7.29-9.56), which correspond to extra-heavy crude that has been biodegraded at the site within the scale of (Peter and Moldowan, 2005) ≥ 5 which is found in reservoir rocks of Miocene age belonging to the Formation Office, Venezuela. For this reason, it is important to know the generation and concentrations of H₂S, CO₂ and all the acid gases generated and the possible organosulphur compounds present since they are the precursors of damages in the human being as in the industry.

In the present investigation the experimental simulations were carried out in reactors in lines with parameters of pressure and temperature of (750 Psi, 1200Psi, 200 ° C and 300 ° C) where the V_{oil}:V_{water} is 1: 2 and sands of (95.5% SiO₂, 1.2% FeS₂ and 3.3% clay minerals, these reactions were generated in gold tubes at time intervals of 1 to 21 days, (Figure 1) where once the reactions were complete acuofermolytic the extracted gas was injected in gas chromatograph to identify and quantify the gases generated.

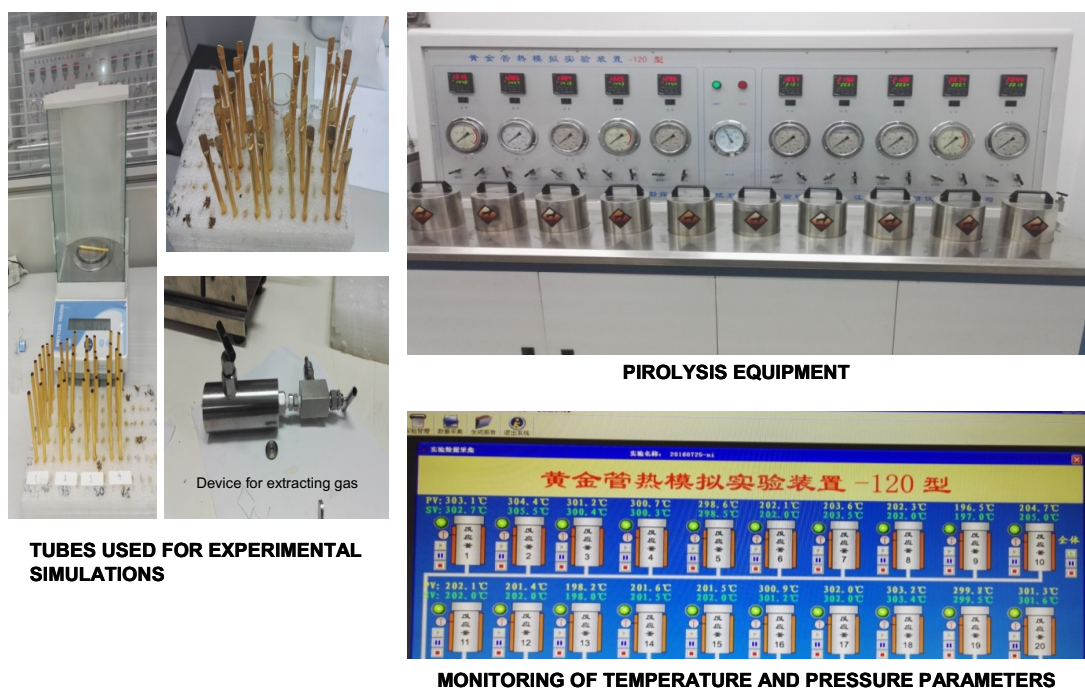


Fig. 1. Methodology for experimental simulations

The results obtained in the present investigation show a proportional relationship between the increase of the temperature and the time of reaction in the generation of H₂S reaching concentrations of 3870 ppm related to 2.55 mL of H₂S / g.oil sand, for the generation of CO₂ as the reaction time increases decreasing the concentration until a minimum of 1.70 mL of CO₂ / g.oil sand is reached, it is important to mention that at 200 ° C the concentrations of H₂S are significantly lower (Maximum generation 0.13 mL of H₂S / g.oil sand equivalent to 212 ppm H₂S) compared to 300 ° C, which suggests possibly thermal cracking of organosulfur compounds identified among them Dibenzothiophenes present in the aromatic fraction of the crude, Said identification was performed using a GCxGC TOF gas chromatograph (Figure 2). The GCxGC system for GCxGC–TOFMS was from Leco Corporation. The GCxGC system was composed of an Agilent 7890 GC coupled to a hydrogen flame ionization detector (FID) and a liquid-nitrogen-cooled pulse jet modulator. The time-of-flight mass spectrometer was a Pegasus 4D (Leco Corporation). All the data were processed with the ChromaTOF software. However, the amount of H₂S generated during the vaporization process is also correlated with the amount of polysulphides (R-Sx-R) thiophenes and Tiols (R-S-H) present (Ibatullin T, et al., 2011).

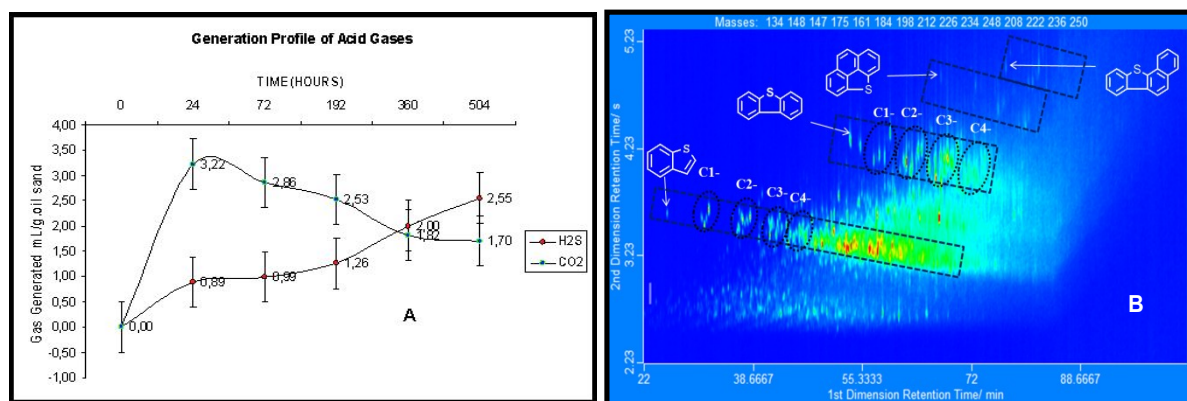


Figure 2. (A) Generation profile of acid gases, (B) 2D Chromatogram of organosulfurated compounds, aromatic fraction.

Referentes

Clark P., Hyne J. (1984) Chemistry of organosulphur compound types occurring in heavy oil sands 3. Reaction of thiophene and tetrahydrothiophene with vanadyl and nickel salts. Fuel 63, 1649-1654.

Ibatullin T, R, Yang E.B, Petersen M Chan, Rismyhrs O, Tollefsen. Simulation of Hydrogen sulfide and dioxide production during thermal recovery of bitumen. Statoil USA 2011.

Peters, K.E., Walters, C.C., Moldowan, J.M. (2005). The Biomarker Guide. V. 2 Biomarkers and isotopes in Petroleum Exploration and Earth History. Cambridge. University Press 1155 p.