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Characterization of crude oil sample from a local South African refinery

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Abstract

Characterization of crude oil and petroleum products comprises of numerous analytical techniques which are complex, time consuming and do not address the major hydrocarbon classes present. SARA analysis have been shown to produce rapid analysis for classifying crude oil and petroleum products in terms of saturates, aromatics, resins and asphaltenes hydrocarbon composition, and an in-depth understanding of asphaltenes structural characteristics, but have not been well investigated in South African refineries. The aims of this study were to use an in-house developed HPLC method and a combination of analytical techniques to determine the estimates of four major hydrocarbon classes in crude oil, lubricant oil, petrol and diesel samples obtained from local refineries, and further investigate the structural characteristics of asphaltenes. The four major classes were successfully identified and determined in the samples studied and from SARA composition of crude oil the colloidal instability index and crystallite parameters were obtained. The crude oil investigated was found to be composed of 38% of saturates, 28% of aromatics, 21% of resins and 11% of asphaltenes. From this composition the colloidal instability index of crude oil sample is estimated to value of 1.02 which suggests a good stability for refining. The composition of petroleum products samples of lubricant oil, petrol and diesel successfully identified saturates and aromatics hydrocarbon classes with a large presence of aromatics. These results provide an understanding of major hydrocarbon classes present in crude oil and petroleum products in the South African fuel specifications.