

Use of ASCI parameter to investigate asphaltenes related issues

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During the last two Petrophase conferences [1],[2], we have introduced the Asphaltene Stability Class Index (ASCI) and the Asphaltene Precipitation Onset (APO), as powerful yet simple tools to study asphaltene related issues. In this paper, we intend to stress out how can the ASCI parameter be used in order to better understand asphaltenes related issues. Two application cases are discussed.

It has been widely reported that contact with mineral acids can promote asphaltene precipitation from crude oil. However, the factors governing these precipitation phenomena have not been completely understood.

In to better understand those mechanisms, we study how the "quality" of the asphaltene contained in the crude oil, determined by the ASCI, and the solvent power of the "oil", also labelled through the ASCI equivalence of the oil, control the precipitation of asphaltenes when the oil is put in contact with a strong mineral acid solution.

To do so, we have selected two crude oils samples. When crude A is put in contact with a mineral acid water solution, no asphaltene precipitation is observed. On the contrary, when crude B is put in contact with a same mineral acid, important asphaltene precipitation is observed: afterwards, it is not possible to solubilise the deposit obtained even in pure toluene !

With crude A, we decided to study, for a given asphaltene composition, the solvent power of the oil as one of the parameter controlling the precipitation.

With crude B, we decided to study how the quality of the asphaltenes presents in the crude oil controlled the precipitation.

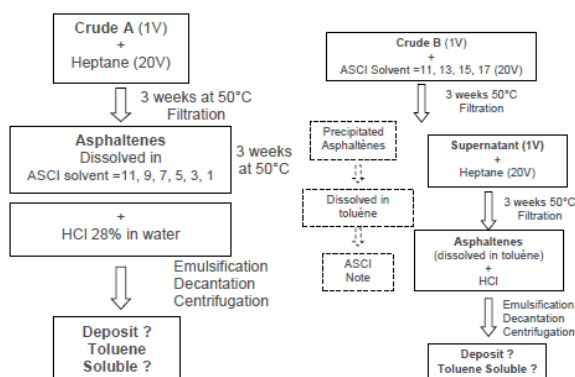


Fig. 1. Schematic of the test protocols used to study acid induced asphaltene precipitations

From previous studies [2], we have seen how certain acid crude oils have very specific properties as far as being able to promote asphaltene stabilisation. The naphthenic acids contained in these crude oils are playing a very big part on this enhanced stabilisation.

These specific properties can be used through blending of oils, either at the refinery - from blending these acidic crude oils with asphaltenic crude oils - or even on production sites - by designing clever tying of wells to production risers.

A kinetic study of asphaltene reorganisation after blending was performed using the ASCI and APO parameters as indicators.

The positive impact of the "good" asphaltene coming from acid stabilizing crude oils on the stabilisation of the asphaltenes blend was felt very surprisingly right after blending on the ASCI, before asphaltenes aggregates reorganization takes place with time.

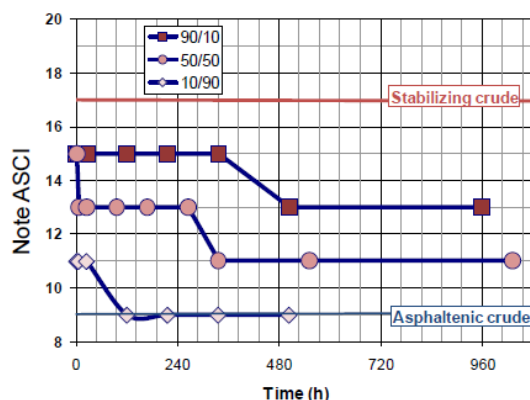


Fig. 2. ASCI versus time after blending for asphaltenic crude oil and stabilizing crude oil ratio of a/ 90/10, b/ 50/50, c/ 10/90

References

- [1] H. Zhou & al., Petrophase 2008, "Understand the intriguing solubility properties of asphaltenes in apolar solvents"
- [2] Passade-Boupat, N. & al, Petrophase 2009, Rio de Janeiro. "An operational acido-basic classification of crude oils"