P-338 - Application of nmr spectroscopy and statistical analysis in characterization of crude oil samples

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Detailed characterization of petroleum samples is of highest priority for quality evaluation of crude oils and crude oil product performances. [1] The crude oil components are usually divided into four main groups: asphaltenes, saturates, aromatics and resins. Asphaltenes are the most complex crude oil components which can aggregate and precipitate during petroleum processing, causing different problems in crude oil industry. [1-3]
Many different analytical techniques and approaches were used to investigate properties and composition of such complex systems as crude oils. [1] In this work it will be demonstrated that NMR spectroscopy is an indispensable tool for investigating crude oil samples. Although 1D NMR spectra of asphaltene samples consist of many overlapping signals, they still provide useful information on composition and aggregation process. It will be demonstrated with several examples that ^{1}H and DOSY NMR techniques in combination with statistical methods such as principal component analysis and machine learning provide powerful approach to identify and classify crude oil samples of different origin. A model can be proposed for prediction of the crude oil stability as an essential parameter that affect oil properties, thus showing potential for practical applications. [3]

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