Data-processing and multi-type anomaly recognition in the geochemical survey in the south slope of the Dongying Depression, East China

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Surface geochemical survey was not widely used in petroleum exploration. To resolve problems in data-processing and anomaly recognition, we have worked up a series of fundamental equations and methods for eliminating surface interference and influences of geological conditions on anomaly intensities and recognizing multi-type anomalies of uni- and multi-variates, by using statistics, fractal geometry, wavelet analysis and artificial neural networks. One of these equations illustrates that the threshold (the boundary between background and micro-seepage anomalies) is determined by means, standard deviations and prior probabilities of background and micro-seepage anomalies when multi-normality is met, and that the traditional equation for the threshold (background mean plus one or two standard deviations) is not correct. In the face of many new equations and methods, it is important how to comprehensively use them to resolve the problems in geochemical surveys. A geochemical survey in the south slope of the Dongying Depression, eastern China provides a good opportunity to address this issue. We iteratively applied the wavelet-analysis-based methods to eliminate the surface interference and geological influence, and statistical methods with new fundamental equations to recognize uni-vairate anomalies of seepage and microseepage. And then, multi-vairate anomalies of seepage and microseepage were recognized with our fundamental equations and methods. In the results, the seepage anomalies display a string-bead-shaped pattern and are distributed along faults, and the micro-seepage anomalies are ring-shaped and coincide with oil/gas pools, sandbodies or traps. Therefore, processing of geochemical data with our fundamental equations and methods combined in the iterative manner can resolve the complicated problems in data-processing and anomaly recognition and thus greatly improve the predictive capability of surface geochemical survey.

Phenylnaphthalenes and terphenyls in mesozoic-cenozoic source rocks of the Qaidam Basin, China

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Source rocks from an inland lake depositional setting from Mesozoic-Cenozoic formations in the Qaidam Basin (west, China) were analysed for aromatics using capillary gas chromatography-mass spectrometry (GC-MS). The triaromatic members of the new series, Phenylnaphthalenes(PhNs) and terphenyls(TrPs), are found in different type of source rock(Ⅱ and Ⅲ) investigated. The isomeric composition of the phenylnaphthalenes and terphenyls was found to depend on thermal maturity. In the lower maturity samples abundances of 1-PhN and o-TrP are higher. Increase in sample maturity is indicated by an increase in the relative abundance of 2-PhN as well as m-TrP and p-TrP. Three thermal maturity parameters of the organic matter based on the relative abundances of the PhN and TrP isomers are proposed: PhNR=2-PhN/1PhN, TrP1=p-TrP/o-TrP, and TrP2=(m-TrP+p-TrP)/o-TrP[1]. In general their values are positive correlation versus vitrinite reflectance (Ro) in a range of 0.47-2.75%, While correlation of the conventional biomarker maturity parameters (C_{29} ααα sterane -20S/(20S+20R), C_{31} αβ hopane 22S/(22S+22R), MPI1 ratio) are less apparent with vitrinite reflectance (Ro) in a range of 1.32-2.75%. So the new parameters perhaps are effective reflecting degree of thermal evolution of organic matter in mature-high maturity.

[1] Leszek *et al*. (2001) Org Geochem, 32,69-85.

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