

The Recovery of TOC and Its Application in Source Rocks at High Mature - Over Mature Stage in Deep Petroliferous Basin

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Abstract

In the process of geologic history, the TOC gradually decreased with the mass hydrocarbon expulsion after the source rock entered the mature stage, especially for source rocks that are in high mature or over mature stage. This change is more outstanding. Therefore, it will contribute to the evaluation of the original hydrocarbon generation ability of the source rock as well as the actual contribution amount for hydrocarbon accumulation accurately if the residual TOC in the present source rock is restored to a stage in which the source rock hasn't expelled hydrocarbon. According to the change of residual hydrocarbon generation materials in the evolution process of source rocks, the author restored a geological conceptual model about the TOC recovery, proposed a quantitative pattern between TOC evolution and the main controlling factors. Then, through giving a certain value for each factor calculated the TOC recovery coefficient, made the TOC evolution charts for muddy source rocks and carbonate source rocks in the case of different kerogen types. The main characteristic of this method is that it is able to avoid the deviation that subjective factors and physical simulation experiment conditions may lead to. The results are as follows: with the thermal evolution level increasing, the residual TOC in source rocks reduces gradually, in large hydrocarbon expulsion stages ($R_o=0.5\% \sim 2.0\%$), the reduction amount is biggest for source rocks in high mature-over mature stage ($R_o > 1.2\%$), the recovery coefficient gradually increased with the increasing of R_o . The TOC recovery coefficients can respectively reach to 3.0, 2.0, 1.4 for muddy source rocks in case of kerogen type I? II? III; for carbonate source rocks, the TOC recovery coefficients are respectively 3.2, 2.2, 1.5. For deep source rocks of different kerogen types; the standards of effective source rocks are different, not to mention applying the evaluation standard of shallow effective source rocks. It is not right to remove source rocks with low TOC out of effective source rocks when predicting favorable exploration areas and evaluating of hydrocarbon resources potential in the deep of the petroliferous basin.