Methylated naphthalenes as indicators for evaluating the organic source type of highly degraded oil

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Methylated naphthalenes are widespread constituents of the geochemical samples. We focused on methylated naphthalenes as possible indicators for evaluating the organic source type of severely biodegraded oils and condensates which are poor in useful biomarkers. Alkylated naphthalenes are suggested to be produced mostly by thermal degradation of terpenoids and steroids. Evaluation of the type of source organic matter of oils based on methylated naphthalene isomers has not been commonly carried out, since their precusors have not been fully clarified yet. We investigated the thermochemical changes of dimethyl- and trimethyl-naphthalenes (DMNs and TMNs) generated from hydrous pyrolysis of cadinene, abietic acid and cholesterol whch are typical precursors in land plants and algae for alkylated naphthalenes. The experimental results were further compared with observations in nature.

1,6- and 1,3-+1,7-DMNs are dominant in terrestrial oils [1], being consistent with the results of hydrous pyrolysis of cadinene and abietic acid. 1,2,5-TMN, especially abundant in the hydrous pyrolyzates of abietic acid, is also rich in terrestrial oils [1]. TMNs are generally dominant in terrestrial oils. The relative abundance of 1,3-+1,7-DMNs was far higher than 1,6-DMN in hydrous pyrolyzates of cholesterol. Significantly high abundance of 1,3-+1,7-DMNs is actually observed in marine oils [2-3]. The distributions of DMNs and TMNs from hydrous pyrolysis of terpenoids and steroid are consistent well with those in terrestrial and marine oils.

Methylated naphthalenes are relatively resistant against various degradation and are often major constituents in condensates and biodegraded oils. Changes in the distribution of methlyated naphthalenes during thermal maturation do not seriously affect the abundance of marker compounds. Methylated naphthalnenes can be useful compounds for evaluating the type of source organic matter of highly degradated oil.

[1] Hossain *et al*. *J*. *Petrol*. *Geol*. **37**, 269-286. [2] Younes and Philip (2005) *J*. *Petrol*. *Geol*. **28**, 301-317 [3] Mobarakabad *et al*. (2011) *J*. *Petrol*. *Geol*. **34**, 261-276.