

The effect of organic matter type on formation and evolution of diamondoids

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A series of anhydrous pyrolysis experiments, using sealed gold tubes, were performed on three types of kerogen to investigate the effect organic matter type has on the generation and evolution of thermogenic diamondoids. Based on the compositional variation of pyrolysis products, the cracking of kerogens can be divided into three stages: oil generation (0.6%–1.5% EasyRo), wet-gas generation (1.5%–2.1% EasyRo) and dry-gas generation (> 2.1% EasyRo). The experimental results indicate that diamondoids were mainly generated in the oil and wet-gas generation stages and decomposed in the dry-gas generation stage. In addition to thermal maturity, the formation of diamondoids is also influenced by the type of organic matter. Type I and IIA kerogens produced more diamondoids than Type III kerogen, and diamondoids generated from Type III kerogen were dominantly adamantanes. Therefore, the concentration and concentration ratios of diamondoids can be used to assess the maturity of source rocks (1.0%–1.5% EasyRo) and determine the type of organic matter (1.0%–2.0% EasyRo). Isomerization ratios of diamondoids depend mainly on thermal maturity and the type of organic matter has little effect. The use of isomerization ratios to determine thermal maturity is best for source rocks at higher maturity levels (1.5%–3.0% EasyRo). Therefore, bivariate diagrams of concentration versus isomerization indices of diamondoids (e.g., DMAs/MDs vs. DMAI-1 and DMAs/MDs vs. TMAI-1) can be used to evaluate the source rock maturity over a wider EasyRo range (1.0%–3.0% EasyRo) than single diamondoid parameters. As there are differences in the concentration and distribution of diamondoids in the extracts of three source rocks, the possibility exists to use diamondoid indices of immature rocks to determine the type of source rock.