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A new f_{H2} indicator and a potential oxidization in the depth of sedimentary basins

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Hydrogen fugacity of the sedimentary environment influences the geochemical behaviors of small organic molecules in sedimentary basins. However, it is not clear whether organic geopolymers are also subject to the same influence. Currently, there is a lack of research and relevant evidence on this topic. To shed light on this matter, it is important to establish the correlation between the alkene-to-alkane ratio of occluded hydrocarbons in the asphaltene matrix and hydrogen fugacity, which can help understand changes in hydrogen fugacity in sedimentary organic matter systems. In this study, we employed a dispersion-solid-phase extraction method to identify *n*-alkanes and *n*-alkenes in the low maturity Cambrian asphaltene samples from the northwestern Sichuan Basin. Under hydrothermal conditions, these hydrocarbons undergo cracking and alkene-to-alkane conversion reactions. In particular, the distribution of *n*-alkanes from C_{16} to C_{18} is primarily controlled by the alkene-to-alkane conversion, and the alkene-to-alkane ratio of C_{16} and C_{18} responds quickly to changes in hydrogen fugacity. This response can be used to estimate hydrogen fugacity based on the *P-T* conditions of the system. By comparing the theoretical value of hydrogen fugacity provided by the sedimentary organic matter itself.