

5.碳氮过程与可持续发展

Molecular Structure Limits the Reaction Kinetics of Riverine Dissolved Organic Matter Decomposition

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摘要: Riverine DOM bioavailability and degradation play crucial roles in greenhouse gas emissions, but studies looking at the kinetic decomposition of fluvial DOM remain scarce. The decomposition kinetics of DOC was characterized in this study according to the reactivity continuum model in terms of a probability distribution of decay coefficients through a 28-day bio-incubation experiments of the water samples from the Yangtze River. The link of DOM structure composition with the decomposition kinetics was analyzed using optical and molecular characterization of DOM combined with apparent decay coefficients. Our results revealed that DOM compounds rich in nitrogen and sulfur were mainly removed and demonstrated a transition from an unsaturated to a saturated state over the process of microbial degradation. These heteroatomic compound, which constitute 75.61% of the DOM compounds positively correlated with decay coefficient k_0 , significantly increased the degradation reactivity of DOM and preferentially stimulated the decomposition of DOM in the early stage of bio-incubation. Additionally, we observed that sulfur -containing fractions with high MW values (>400 Da) may be associated with the presence of large reactivity grades. This study underscored the complex interplay between DOM composition and its kinetic decomposition in river ecosystems and provided further support for the significance of inherent properties of molecules in large river DOM as crucial factors affecting decomposition.

关键词: Dissolved organic matter, Yangtze River continuum, Molecular composition, FT-ICR MS, Kinetic decomposition