天然日光辐照下河口区CDOM的光化学降解

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中文关键词 有色溶解有机物 光降解 光漂白 荧光 吸收 九龙江口

英文关键词 chromophoric dissolved organic matter (CDOM) photodegradation photobleaching fluorescence absorption Jiulong River Estuary

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中文摘要

2005年5月初和5月末，对经0.2μm滤膜过滤的九龙江口低盐度水样进行了2次每天6h、为期1周的天然日光辐照实验，研究有色溶解有机物（CDOM）的荧光与吸收性质的光化学降解特征.结果表明，CDOM的类腐殖质荧光（$\lambda_{Ex}/\lambda_{Em}$=350/450 nm）、类色氨酸荧光（$\lambda_{Ex}/\lambda_{Em}$=225/350 nm）以及吸收系数在初夏短期日光辐照下均发生明显的光化学降解，其降解过程符合一级动力学方程，相应计算出类腐殖质和类色氨酸荧光以及吸收系数A(280)的半衰期分别为3.5～5.1 d、3.0～4.5 d及6.3 d.吸收损失光谱研究表明，对CDOM光降解起主要作用的是太阳辐射的紫外波段.照射42 h后，类腐殖质荧光的损失（70%）远高于吸收系数A(280)的损失（约40%），表明CDOM荧光团比发色团更易被光漂白，但两者之间仍保持良好的正相关性.与对照组相比，CDOM经日光辐照后其A_{250}/A_{350}比值增大，表明光化学降解可使其平均分子粒径变小.结果表明，CDOM在入海后可通过光降解作用在近海海域发生转化及清除，光降解是陆源CDOM入海后的一个重要归宿.

英文摘要

Low salinity water sample collected from Jiulong River Estuary filtered using 0.2 μm Millipore filter was exposed to natural solar radiation from 10:00 to 16:00 each day during one week period in early and late May, 2005. Photodegradation of fluorescence and absorption properties of CDOM (chromophoric dissolved organic matter) was observed. The results showed that humic-like fluorescence ($\lambda_{Ex}/\lambda_{Em}$=350/450 nm), tryptophan-like fluorescence ($\lambda_{Ex}/\lambda_{Em}$=225/350 nm) and absorption coefficient of CDOM can be significantly photodegraded during short-term solar exposure in early summer. These photodegradation processes followed the first-order dynamic equation. The degradation half time of humic-like fluorescence, tryptophan-like fluorescence and A(280) were calculated as 3.5-5.1 d, 3.0-4.5 d and 6.3 d. The absorption loss spectra of CDOM indicated that the solar UV radiation was responsible for the photochemical degradation of CDOM. The loss of humic-like fluorescence (70%) was obviously higher than loss of A(280) (about 40%), suggesting that photobleaching ability of CDOM fluorophores were much stronger than CDOM chromophores. However, the correlation relationship between humic-like fluorescence and absorption coefficient are still kept. A_{250}/A_{350} of CDOM increased till the end of radiation experiment compared with the control group, suggesting photodegradation may decrease the average molecular size of CDOM. These findings show that terrestrial CDOM can be transformed and removed by photochemical decomposition after transport into the sea, and photodegradation might be an important sink for terrestrial CDOM.