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硕士学位论文

东海和南海北部典型海区沉积物中
光合色素的研究

Studies on Sedimentary Pigments in the Typical Areas of
East China Sea and Northern South China Sea

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中文摘要

分别于 2009 年 7~9 月、2009 年 12 月~2010 年 1 月在东海和南海北部以及 2009 年 6 月 15~18 日在珠江口伶仃洋、2010 年 4 月 2~10 日在长江口开展了表层沉积物中光合色素组成、含量以及分布特征的研究,同时讨论了环境因子、水柱中浮游植物群落组成对其含量及分布的影响,取得如下主要结果:

1、FUCO、ZEA、CHLA 和 BCAR 是东海和南海北部表层沉积物的主要光合色素,其它光合色素如 CHLC1/C2、PERI、19BUT、NEO、PRAS、DIAT、DIAD、19HEX、ALLO、LUT 和 ACAR 仅存在于少数测站,东海沿岸流泥质沉积区光合色素含量较高,而南海北部准残留沉积区较低。19BUT、FUCO、19HEX、ALLO、ZEA、LUT、CHLA 和 BCAR 为长江口和珠江口伶仃洋表层沉积物的主要光合色素,长江口光合色素的含量大于珠江口。

2、沉积物中各辅助光合色素与 CHLA 的比值均大于水体,表明其在沉积物中发生了降解,且 CHLA 降解较快;南海北部沉积物中 FUCO 和 CHLA 与水柱中的含量呈显著的正相关关系,反映了在该区沉积物中 FUCO 和 CHLA 受水柱中浮游植物类群的影响较大,沉积物中的光合色素主要来自于短时间内水柱中浮游植物的沉降物。

3、底层溶解氧和温度与沉积物中光合色素的含量呈负相关关系,沉积物中光合色素含量与水柱营养盐呈正相关关系,营养盐的分布间接影响着沉积物中光合色素的分布。在东海沿岸流泥质沉积区和南海北部沉积区,FUCO 和 ZEA 与硝酸盐呈显著正相关关系,在东海准残留沉积区,FUCO、ZEA 和 CHLA 与硅酸盐呈正相关关系,水深和混合层深度与主要光合色素的含量呈负相关关系。

关键词:沉积物光合色素;组成;含量;东海;南海北部;珠江口;长江口

Abstract

Four cruises, two in the East China Sea and the northern South China Sea during July-September 2009 and December 2009-January 2010, respectively, another two in Lingdinyang of Pearl River Estuary and Changjiang River Estuary during June 2009 and April, 2010, respectively, were carried out to study composition, concentration and distribution patterns of sedimentary pigments. In the meantime, environmental factors, such as physical, chemical and biological, were studied to influence their concentration and distribution, the main results are as following:

FUCO, ZEA, CHLA and BCAR were abundant pigments in surface sedimentary pigments in the East China Sea and northern South China Sea, while CHLC1/C2, PERI, 19BUT, NEO, PRAS, DIAT, DIAD, 19HEX, ALLO, LUT and ACAR were less in concentration and low frequency of occurrence. The mean concentrations of sedimentary pigments were higher in the coastal current muddy sediment area of East China Sea than those in the relict sediment area of northern South China Sea. 19BUT, FUCO, 19HEX, ALLO, ZEA, LUT, CHLA and BCAR were main photosynthetic pigments in the Changjiang River Estuary and Lingdinyang of Pearl River Estuary, mean concentrations of sedimentary pigments were higher in the Changjiang River Estuary than those in the Lingdinyang of Pearl River Estuary.

The ratios of auxiliary photosynthetic pigments to chlorophylls *a* in water column were smaller than those in surface sediment, which suggested that more rapid decomposition of chlorophylls *a* in sediment. In each study area, fucoxanthin and chlorophylls *a* were only two pigments which had well positive correlation between water column and surface sediment, which suggested that sedimentary fucoxanthin and chlorophylls *a* were affected significantly by the phytoplankton in water column. In the meantime, sedimentation rate was higher and the sedimentary pigments came from the sinking of phytoplankton in the water column in a short time.

The results also showed that negative correlation was observed between the sedimentary pigments and the oxygen concentration, temperature at bottom water, while positive correlation between sedimentary pigments and nutrient in water column. In the coastal current muddy sediment area of East China Sea and northern South China Sea, fucoxanthin and zeaxanthin were significantly positive with nitrate

in water column, while in relict sediment area in the East China Sea, fucoxanthin, zeaxanthin and chlorophylls *a* were significantly positive with silicate in the water column. The concentrations of major sedimentary pigments showed negative correlation with the water depth and mixing layer depth in the study areas

Key words: Sedimentary pigments; Composition; Concentration; East China Sea; northern South China Sea; Lingdinyang of Pearl River Estuary; Changjiang River Estuary

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缩略词表

缩略词	英文名称	中文名称
19BUT	19'-butanoyloxyfucoxanthin	19'-丁酰基氧化岩藻黄素
19HEX	19'-hexanoyloxyfucoxanthin	19'-己酰基氧化岩藻黄素
ACAR	α -carotene	α -胡萝卜素
ALLO	alloxanthin	别藻黄素
BCAR	β -carotene	β -胡萝卜素
CHL C1	chlorophyll <i>c</i> 1	叶绿素 <i>c</i> 1
CHL C2	chlorophyll <i>c</i> 2	叶绿素 <i>c</i> 2
CHL A	chlorophyll <i>a</i>	叶绿素 <i>a</i>
DIAD	diadinoxanthin	硅甲藻黄素
DIAT	diatoxanthin	硅藻黄素
DMF	N,N-Dimethylformamide	二甲基甲酰胺
DO	dissolved oxygen	溶解氧
FUCO	fucoxanthin	岩藻黄素
HPLC	high performance liquid chromatography	高效液相色谱
LUT	lutein	叶黄素
NEO	neoxanthin	新黄素
NO ₂ -N	nitrite	亚硝酸盐
NO ₃ -N	nitrate	硝酸盐
PERI	peridinin	多甲藻素
PPC	photoprotective carotenoids	光保护色素
PRAS	prasinoxanthin	青绿藻素
PSC	photosynthetic carotenoids	光合类胡萝卜素
rpm	round per minute	转每分
SD	standard deviation	标准偏差
SiO ₃ -Si	silicate	硅酸盐
t _R	retention time	保留时间
VIOLAX	violaxanthin	莖菜黄素
ZEA	zeaxanthin	玉米黄素

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