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BLACK CARBON IN MARINE SEDIMENTS

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ABSTRACT

Samples were prepared for the estimation of Black Carbon (BC). Prepared samples were subjected to elemental analyzer for the concentration of Black carbon. These samples were collected from the different locations of Venezuelan coastan area.

Beside the BC estimation some of the samples have also been analyzed for organic carbon (OC) by colourimetric and titration (Walkly and Black) methods.

Key words: Black carbon, marine sediments and organic carbon.

INTRODUCTION

Recent findings have confirmed the importance of Black carbon (BC) in the global biogeochemical cycles of carbon and oxygen through its important contribution to the slowly cycling organic carbon (OC) pool. Black carbon (BC) is a product of incomplete combustion of vegetation and fossil fuels, which can be found in soils, sediments, ice corse and the atmosphere. It is the main light absorbing constituent in the aerosol[1], the good record of fire history in the sediments and ice corse[2] and the excellent adsorbent for many organic pollutant in modern sediments. It also plays an important role in the biogeochemistry cycle of carbon and global climate change[3-4]. Black carbon is an important constituent of the total organic carbon (TOC) in the ocean sediments which by estimation makes up approximately 6% of TOC stored globally in ocean sediments[5], and even as high as 90% in some areas[2]. The first black carbon estimation was reported in 1973[6].

EXPERIMENTAL

Preparation of samples

70.0 gm sediment sample was treated with HCl (6M) 300 ml at 60°C for 20 hrs. After the digestion content were centrifused at 1870 rpm for 30 minutes. Supernant was decanted and the residue rinsed three times with 2M HCl. The solid residue was transferred to Teflon beaker and demineralised at 60°C for 20 hrs. in conc. HCl (6m) and HF (22m) mixture 300 ml at volumetric ratio 1:2. After digestion the content of the beaker was transferred to the plastic centrifuse bottles and centrifuse and supernant liquid was decented.

To isolate BC above residue was taken and add $K_2Cr_2O_7$ (0.1M) and H_2SO_4 (2M) 300 ml in the ratio of 1:2 to oxidize kerogen at 55°C for 60 hrs. At the end of the reaction, the bottle was placed in cold water bath for about 5 minutes. The supernatant liquid was decented and the residue was rinsed 5 times with distilled water and the sample was oven dried at 60°C for 48 hrs[7-9].

Detection of BC

Finally the sample treated by above two steps was analyzed on CHN analyzer for black carbon concentration.

Detection of organic carbon

a) Colourimetric method

All the digested supernatant $K_2Cr_2O_7$ and H_2SO_4 mixture (from BC estimation) was taken in a

25 ml centrifuse tube and it was centrifused for 15 minutes at 500 rpm. Supernatant liquid qas used for the determination of adsorbent at 600nm.

A calibration curve was prepared with glucose concentration of 2.5, 5.0, 7.5 and 10.0 mmC/ml. To each solution 2.0 ml of $K_2Cr_2O_7$ (2N) and 4ml of conc. H_2SO_4 were added and adsorbances were recorded. 1.0 ml distilled water was used as blanck with same amount of above chemical[10].

b) Titration method

1.0 ml supernatant (from BC estimation) $K_2Cr_2O_7$ and H_2SO_4 mixture was transferred in 100ml conical flask. The content were diluted with 50 ml distilled water followed by 2.5 ml phosphoric acid. 1.0 ml diphenyl amine indicator was also added. The contents were titrated against 0.5N ferrous ammonium sulphate at the end point colour chages to brilliant green. The 1.0 ml distilled water was used as blank with same amount of chemicals[10].

RESULTS AND DISCUSSION

The results aobtained during the course of present investigation are being tabulated in Tables 1-3.

Table - 1: Detection of black carbon

No. of samples	Samples code	% C by carbon analyzer
1	1	0.020 + 0.009
2	4	0.746 + 0.041
3	12	5.01 + 0.47
4	13	0.150 + 0.47
5	14	3.14 + 0.28

Table - 2: Estimation of organic carbon by calorimeteric method

No. of samples	Samples code	Absorbance	Conc. mg C/ml
1	1	0.457	147.5
2	4	0.244	12.5
3	12	0.200	62.5
4	13	0.247	12.5
5	14	Out of range	-

The black carbon (BC) concentration obtained CHN analyzer (Table 1) clearly indicates the presence of high BC in sample No. 3 and 5. This is because of high sedimentation in these sample collection areas. Very less black carbon was detected in Sample No. 1.

Organic carbon was also detected (Table 2) by colourimetric method. The concentration of OC was found to be detected in the range of 12.5 to 147.5 mg C/ml. But in the sample no. 5 no organic carbon was detected. the presence of high organic carbon in the samples is because of high organic species present in sediments.

Organic carbon concentration was also determined (Table 3) by Walky and Black method[10]. By this method the concentration was found in the range 151.9 - 1090 µg/g. The concentration in sample 1. was not detected whereas the concentration in two samples are lower and in other two samples are higher. This is because of atrendum distribution of organic species in the samples.

By comparing all the three estimation methods we can conclude that the black carbon (BC) is present in the sediment samples. This is because of incomplete combustion of vegetation and fossil fuels.

Table - 3: Estimation of organic carbon by titrimetric method

No. of samples	Samples code	Titration reading (ml of FAS used)	% C	Organic carbon ug/g
1	1	-	-	-
2	4	4.5	0.0943	943.0
3	12	0.5	0.1629	162.0
4	13	0.55	0.1090	1090.0
5	14	2.5	0.01519	151.0

- 1.0 ml of aliquot of digested sample was used in titration
- Blank is 30.0 m
- $K_2Cr_2O_7$ = 0.1 N

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