EXTRACTION POTENTIAL OF DIFFERENT SOLVENTS IN THE STUDY OF ORGANIC MATTER CONCENTRATIONS IN THE ENVIRONMENT

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Abstract

The extraction potential of three solvents: dichloromethane, sodium pyrophosphate and dichloromethane:methanol (DCM:MeOH, 93:7 v/v) in extracting organic matter for organic matter type and concentration studies in the environment has been tested. Three sandstone samples were dissolved in the solvents and the extract analyzed using UV-Vis spectrophotometer. Analysis based on the absorbencies of humic acids (E4) and fulvic acids (E6) indicate sodium pyrophosphate as the most potent solvent, followed by dichloromethane and finally DCM:MeOH, 93:7 v/v.

Introduction

The quantity and quality of organics has an impact on environmental geochemistry. The quality of organics can be evaluated by a variety of extraction techniques. These techniques include variations in solvents such as methanol, dichloromethane and sodium pyrophosphate. The response of samples to various types of extractants is also indicative of the potential of the samples to release such organics in similar geochemical conditions. Therefore, the objective of

this study is to use different solvents in the extraction of organic matter for ultra violet visible (UV-Vis) studies and to determine which solvent has the highest extraction potential.

Materials and Methods

UV-Vis is a powerful technology used by scientists to characterize organic fractions (Schnitzer and Khan, 1978). Previous work by researchers such as Stevenson (1982) used the UV-Vis technique as a measure of aromacity. For the purpose of this study, the UV-Vis analysis will be focused on absorbencies at 465nm (E4) and 665nm (E6). These represent absorption of humic and fulvic acids respectively in the environment. A ratio of E4 to E6 which is independent of concentrations of the humic material can be calculated as a measure of aromacity (Ramli and Padmanabhan, 2010).

Three samples (S1, S2 and S3) have been analyzed in this study. 0.1g of each sample was treated with three different solvents: dichloromethane, 0.1M sodium pyrophosphate and dichloromethane:methanol (DCM:MeOH, 93:7 v/v) (Pan et al., 2005) to extract the organics for 48hours and the extract analyzed using a Shimadzu UV-3150 UV Vis Spectrophotometer.

Results and Discussion

Table 1: E4 and E6 of S1, S2 and S3 with dichloromethane

Sample ID	E4 (Humic acid)	E6 (Fulvic acid)
S1	1.42	1.39
S2	1.26	1.03
S3	1.12	0.79

Table 2: E4 and E6 of S1, S2 and S3 with 0.1M sodium pyrophosphate

Sample ID	E4 (Humic acid)	E6 (Fulvic acid)
S1	1.05	0.96
S2	1.70	1.58
S3	1.80	1.68

Table 3: E4 and E6 of S1, S2 and S3 with DCM : MeOH, 93:7 v/v

Sample ID	E4 (Humic acid)	E6 (Fulvic acid)
S1	1.43	1.17
S2	1.42	1.15
S3	1.14	0.88

E4 and E6 values for dichloromethane extracts range between 1.12-1.42 and 0.96-1.68 respectively (Table 1). E4 and E6 values for sodium pyrophosphate extracts range between 1.05-1.80 and 0.96-1.68 respectively (Table 2). E4 and E6 values for DCM : MeOH extracts, 93:7 v/v range between 1.14-1.43 and 0.88-1.17 respectively (Table 3). The highest E4 and E6 values were recorded for sodium pyrophosphate followed by dichloromethane and finally DCM : MeOH, 93:7 v/v. Sodium pyrophosphate therefore has the highest extraction potential among the three solvents and is the most efficient among them for extraction of organic matter for analysis.

Conclusion

All three solvents used have the potential to extract considerable amounts of organic matter. Sodium pyrophosphate has the highest extraction potential followed by dichloromethane and finally DCM:MeOH, 93:7 v/v.

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