

Spectroscopic studies (FT-IR, ^{13}C and ^1H -NMR) of macroaggregates in the northern Adriatic

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Introduction

The mucous macroaggregates in the northern Adriatic Sea are primarily the product of phytoplankton (mostly diatoms) production in favourable oceanographic conditions during late spring and summer. They are thought to be the result of aggregation of extracellular macromolecular DOM.

Experimental

Mucous macroaggregates, in the form of cloud-like structures and of gelatinous surface layer, were collected in sea surface and water column in the southern part of the Gulf of Trieste (northern Adriatic Sea) during recent mucilage event in summers of 1991, 1997 and 2000. ^{13}C and ^1H NMR, and FTIR spectra of freeze-dried macroaggregates were recorded on a Bruker VVX 300 spectrometer and Perkin-Elmer System 2000, respectively.

Discussion of results

^1H NMR study of samples from summers of 1991, 1997 and 2000 identified four major classes of structural elements: carbohydrates ($\delta=3.4\text{-}5.8$ ppm), aliphatic component ($\delta=0.9\text{-}1.8$ ppm), functional groups such as ester and amide groups ($\delta=2.1\text{-}2.7$ ppm) and organosilicon compounds mostly of diatoms ($\delta<0.7$ ppm). FTIR and ^{13}C NMR spectra confirmed this composition. XRD and EDS analyses indicated the presence of mineral particles especially calcite, quartz and silicates, entrapped into macroaggregate structure. They prevail in water-insoluble fraction and conversely, the water-soluble fraction was mostly composed of carbohydrates. During the mucilage event (maturation) the aliphatic structures bonded to Si and carbohydrates through carboxyl and amide groups increased contributing to the persistence and stability of macroaggregates. The observed temporal decrease of carbohydrate content was most probably due to microbial and photochemical degradation of reserve polysaccharides in the summer stratified water column when macroaggregate production and sedimentation was low.

References

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Gold and silver in massive sulfide deposits at Asian areas of Russia

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Massive sulfide deposits in Asian areas of Russia are represented by two types: volcanic-hosted and sediment-hosted deposits. The first type includes deposits situated in the NW Rudnyi Altai, in Salair Range, and in Eastern Tuva. All these deposits being formed in island-arc systems are associated with submarine volcanism of both bimodal and differentiated series. The second type involves two giant deposits such Ozernoe deposit in the Western Transbaikal region and the Kholodninsk deposit in the Northern Baikal region. Both these deposits are confined to flishoid-turbidate sequences as in the intervalvolcanic depression so in riftogeneous structure, respectively. Hydrothermal-sedimentary ore-forming processes are associated with dacite-andesite-basalt and tholeiite-basalt volcanism. At the Ozernoe deposit, ores occur in terrigenous-carbonate rocks and they show evidence of being formed under relative oxidizing conditions. At the Kholodninsk deposit, precipitation of ores in pyrrhotite-carbonaceous-siliceous shales is associated with very anoxic environment.

Ores of the first type of deposits contain gold (1-1.5 g/t) and silver (15-30 g/t). The irregular distributions of gold and silver within orebodies and the correlation between these elements have been found. The gold concentrations in ores of the second type are close to the abundance ratio of gold. Gold concentrations don't depend on environment of basin sedimentation. The silver concentrations in these ores are 15-80 g/t. Obviously, submarine hydrothermal systems forming hydrothermal-sedimentary ores were initially depleted in gold, silver concentrations being the same or even higher than those in volcanogenic deposits. The different character of gold accumulation in ores of two types can be attributed to the nature of ore-forming systems. Sulfur of volcanogenic deposits is compositionally close to magmatic sulfur, whereas sulfur of hydrothermal-sedimentary ores is enriched in heavy sulfur.

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