PETOLA-STROMATOLITIC BASEMENT FOR MANUAL GATHERING OF SALT IN SECOVLJE SALINA

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Abstract
In Secovlje Salina (Gulf of Trieste, northern Adriatic), the stromatolitic microbial mat named "petola" is a crucial element in old mediaeval manner of salt-production so the understanding of its chemistry is very important for the preservation and progress of this activity. The chemical study (FT-IR, ^{13}C-NMR, elemental analyses) was performed to investigate the petola composition and its transformations during salt-making processes
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Introduction
In Secovlje solar salterns (northern Adriatic, Slovenia) the salt is still produced with traditional procedures by manual gathering of salt on the petola i.e. microalgal mat composed mostly of cyanobacteria, diatoms and other microalgae impregnated with minerals (gypsum, Mg-calcite…). Petola prevents sea mud from mixing with salt so this naturally produced salt is rich in minerals and purely white. This biological-chemical facet has a special role in the precipitation/dissolution processes so the understanding of its chemistry is very important for the preservation and progress of this activity. The presented results upgrades the previous chemical study of petola samples from 2006 [1].

Materials and methods
Sampling was carried out in the crystallizer pond on May 14th (Sample A), June 9th (Sample B), and July 30th (Sample C), in 2009. Surficial sediment samples (0-2 cm) were collected using 40 mm diameter gravity core sampler and then the tiny slice of surface sediment i.e. 2-3 millimeter thick layer of biosediment was cut offand frozen. The freeze-dried samples were grounded to a fine powder and used for elemental, ^{13}C-NMR and FT-IR analyses.

Results and discussion
The FT-IR analyses of petola samples (Figure 1) confirmed the fractional crystallization of different salts according to the increasing evaporation and salinity. First to crystallize are carbonates and sadra (brine conc. >13 Bé), followed by NaCl (brine conc. ~25 Bé) and finally magnesium salts (brine conc. >26 Bé) [2]. Unfortunately, the NaCl is transparent to the infrared light and not introduce any lines onto the spectra. The alteration of organic fraction of petola was detected during its maturation and increasing brine salinity concentration. Cementation during petola cultivation contribute to its stabilization and a higher hardnes allowing the manual gathering of salt on this basin's base.

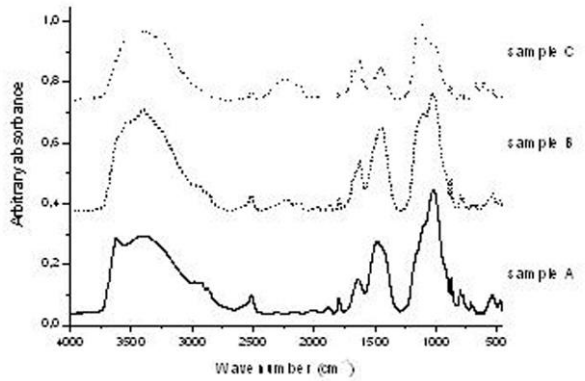

Fig. 1. FT-IR spectra of petola samples (Secovlje Salina)

Major FT-IR spectra bands could be assigned: 3625 cm^{-1} (clay minerals), 3000-3600 cm^{-1} (O-H and N-H stretching band region), 2800-3000 cm^{-1} (organic carbon i.e. CH_2 and CH_3 alkyl groups), 1653-1640 cm^{-1} (proteinic component, water signals, aromatic and olefinic C=C groups), carbonates, (2514, 1795, 1420-1450, 876 and 713 cm^{-1}), silicates (1870, 1160, 1020, 799, 780, 696 and 534 cm^{-1}), sadra (3407, 1683, 1621, 1141, 1118, 669 and 602 cm^{-1}). Evaluation of ^{13}C NMR data will give us further insights into the composition and reactivity of petola organic carbon.

References
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