

Abstract

The major aim of this thesis is critical evaluation of Raman spectroscopy in the detection of carotenoids of extremophiles, namely snow algae. Extremophilic microorganisms play an important role in exobiology since they set hypothetical boundaries for the presence of life on Earth. Raman spectroscopy will be a part of two mission to Mars. Here, a laboratory Raman microspectrometer was used for the analysis of 11 samples of snow algae from different locations over the years 2002–2017. The acquired spectra were compared with HPLC/UV-VIS analysis. The results showed that the ability of Raman spectroscopy to discriminate between structurally slightly differing carotenoid pigments or several carotenoids in an admixture is limited. Contrary, HPLC/UV-VIS permitted to detect various structurally similar carotenoids (and chlorophylls). However, HPLC/UV-VIS worked with overall pigment extracts during which some structural information can be lost. Raman microspectrometer allowed analysis of cells in different life-cycle stages and thus several various spectra could be studied. Raman microspectrometer was therefore more suitable for carotenoid detection in mixtures of various life-stages than HPLC/UV-VIS.

Key words

carotenoids, snow algae, exobiology, habitability, biomarker, Raman spectroscopy, HPLC/UV-VIS