Limits for Raman spectroscopic discrimination of pigments of microorganisms

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Raman spectroscopy has repeatedly been suggested as a powerful technique to detect biological markers for Mars lander missions. Raman spectrocopy was successfully used to detect sunscreen pigments in Antarctic cyanobacteria which are an example of extremophiles living in extremelly cold areas under high UV exposition. Studies carried-out previously in our group allowed to assess the distribution of photoprotective or photosynthetic pigments in endoliths of different types inluding those from the driest parts of the Atacama desert [1]. Here, for comparative purposes, extracts from cultures of microorganisms were submitted to HPLC and Raman analysis to better address potential analytical pittfalls. Generally speaking, the identificaton of pigments using Raman bands positions was achieved directly on cultures of microorganisms from different groups. In relatively simple situations where only few diagnostic carotenoids occur in the cells, Raman spectroscopy allows excellent identification (e.g. *Halorubrum sodomense* with α-bacterioruberin and its derivatives and *Salinibacter ruber* with salinixanthin) [2]. Moderate shifts can however occur in the spectra and care must be taken for correct identification of carotenoids from other microorganisms containing more, structurally very similar carotenoids (*Porphyridium cruentum*, examples from the genera *Brasilonema*, *Scytonema*). Raman spectra of whole extracts and collected fractions show limits of unambiguous discrimination of individual similar carotenoids. New possibilities of improving discrimination of carotenoids are discussed.

[1] Vítek *et al*. (2014) *Phil. Trans. R. Soc. A* **372**, 20140196.
[2] Jehlička *et al*. (2014) *Phil. Trans. R. Soc. A* **372**, 20140199.