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Preservation of organic functional groups in cyanobacteria during diagenesis as studied by *in situ* infrared heating experiments

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In order to study relative preservation of different organic functional groups in microfossils during diagenesis, *in situ* heating IR analysis of cyanobacteria *Synechocystis* sp. PCC6803 was conducted. The cyanobacteria samples embedded with and without amorphous silica were heated at 200-500 ˚C on a heating stage placed in an IR microscope under both atmospheric and low-oxygen conditions. The absorbance of aliphatic CH_2, N-H, C=O (amide I) and C-N-H (amide II) decreased with time, indicating degradations of those functional groups. The aliphatic $CH_2$was found to be the most refractory functional group under both the low-oxygen and atmospheric conditions. This is consistent with the results of Proterozoic microfossils in Bitter Spring Formation ($\sim$850 Ma) containing detectable IR signature of aliphatic CH_2. The degradation rates of aliphatic CH_2 under the low-oxygen condition were several orders of magnitude slower than those under the atmospheric condition, and the embedding with amorphous silica decreased the degradation rate. Extrapolation of the results to the temperatures of diagenesis yields that the aliphatic CH_2 can be preserved in microfossils at least more than 10^2-10^4 yr at 50-100 ˚C.