Astrobiology and green chemistry: A new pedagogical connection (Abstract for presentation at SPIE 2009)

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ABSTRACT

Various pedagogical approaches are needed to introduce astrobiology into the chemistry curriculum. We are developing a new approach in which we connect green chemistry with astrobiology. Green chemistry is chemistry which is environmentally friendly. One obvious way for the organic chemistry to be environmentally friendly is to use water as solvent, instead of more toxic organic solvents. Another approach is to run so-called solventless reactions. For example, as the solid materials are mixed together, the melting point of the mixture is lower than the melting points of its individual components (the principle of the mixed-melting point). In some cases the entire mixture may melt upon mixing. The reactions would then occur in a viscous semi-solid state. An additional approach is to run the reactions by utilizing enzymes or man-made protein mimics as catalysts instead of toxic catalysts, such as those based on the transition metals. These and some other known examples of green chemistry have a great potential for astrobiology. The astrobiological reactions typically occur in water (e.g. prebiotic soup), in the solid mixtures (e.g. on the meteors), and may be catalyzed by various short peptides. The connection between the green chemistry