הטכניון - מכון טכנולוגי לישראל

TECHNION - ISRAEL INSTITUTE OF TECHNOLOGY

הפקולטה להנדסה כימית
ע"ש וולפסון
The Wolfson Department of Chemical Engineering

The Wolfson Department of Chemical Engineering
Special Seminar at Lecture Hall No. 6,
Wednesday August 8th at 1:30pm

Shoval Gilboa

MSc. Student (supervisor: Prof. Yaron Paz)
Department of Chemical Engineering, Technion

Formation of nucleic bases, sugars, and nucleotides from prebiotic substances using heterogeneous catalysis

The origin of life, namely the scenario by which the first biological molecules were formed, is one of the most intriguing scientific mysteries. Among the various suggested scenarios, the hypothesis that life originated from RNA-like molecules is one of the most accepted. This hypothesis is based on the presence of RNA oligomers serving both as information carriers and as functioning enzymatic entities.

Here we present a study on the possibility of forming nucleic acids and their sub-units (pentoses and nucleic bases) from pre-biotic substances (formaldehyde, formamide) using heterogeneous catalysts. In particular the possibility of using composite catalytic particles, where each component catalyzes one type of a reaction was studied. These composite catalysts include $Mg_x(OH)_y/Ca_x(OH)_y$ and hydroxyapatite/titanium dioxide. Various nucleotides and nucleosides were found, depending on the type of catalyst and on the conditions prevailing during preparation. While not all types of nucleotides were obtained, the results definitively point out to the hardly explored heterogeneous route as a viable route that should be further studied.

Yizhak Tzvi

MSc. Student (supervisor: Prof. Yaron Paz)
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Highly efficient method for oxidation of dissolved hydrogen sulfide in water, utilizing a combination of UV-C light and dissolved oxygen

Hydrogen sulfide is a hazardous contaminant that may appear in well-water and in sewage streams. Here we present a very efficient way for the removal of H_2S from well-water, based on combining UVC light and oxygen. The method was tested with H_2S-enriched tap water as well as with natural well water, both of which containing up to 20 ppm of H_2S. A conversion of up to 90% was obtained within a residence time of no more than a few minutes. The quantum efficiency, defined as the ratio between the number of removed H_2S molecules to the number of impinging photons, was found to be as high as 70%, depending on conditions. The main product was found to be sulfate, without the appearance of elemental sulfur, i.e. with no major change in turbidity. The absence of sulfur in the outlet stream in of large importance when treating H_2S-containing well-water, since it omits the need for posttreatment removal of particles. Results are explained by the excitation of HS^- species, following by formation of polysulfide anions that readily react with any formed elemental sulfur, eventually yielding sulfate ions.

Refreshments will be served at 1:15pm