

BIOINSPIRED PHOTOREDOX CATALYSIS - SYSTEMS BASED ON FREE-BASE PORPHYRINS

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„There are three rules allowing detect the most developed communities. These Rules are Garbage, Noise and Stains. Every civilization in the technical phase begins to slowly sink into the garbage, which causes a great problem until the refuse is sent into space. In order for waste not to disturb us too much in space, it is sent over to a specially allocated orbit. A more advanced era of progress can be recognized thank to this growing circle of refuse ”

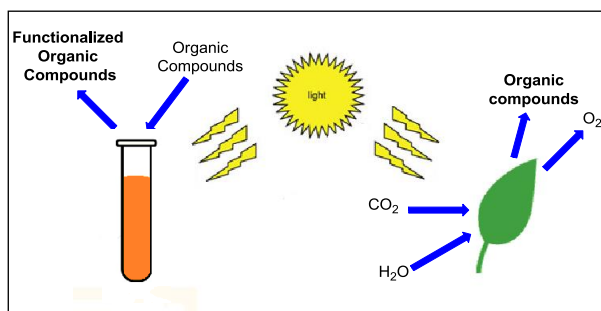
Stanislaw Lem

Stanislaw Lem's vision came true. Our planet is currently struggling to cope with the destructive forces of environmental pollution, wastes, extinction of rare species and consumption of our limited fossil fuel resources.

How to change the world and make it better place to live?

The further development of our civilization needs to be more environmentally sustainable. It is a task for every researcher in particular chemist who can use technological advances, modern laboratories and materials, and above all - their knowledge to solve environmental problems.

As a paradox, in order to become greener, we must learn from the one we are trying to save, Nature.



An example of a process which can inspire us is undoubtedly photosynthesis. Photosynthesis is a process used by plants to convert light energy into chemical processes, which is possible thanks to the special properties of porphyrins – pigments of life. My answer to the environmental problems is the use of free and inexhaustible solar radiation as an energy source and

non-toxic catalysts similar to those used by Nature in photosynthesis. It is only recently that organic chemists have started to realize the potential of light and have begun to utilize it to drive reactions. However, shining light onto a reaction usually has no effect; one must use a catalyst that will transfer the lights energy in a positive way. This is known as “Photocatalysis”.

The goal of my project is to create a new organic, bioinspired photoredox catalyst. I want to create a photocatalytic system based on free-base porphyrin and use it for arylation of heteroarenes, in the first instance, and consequently to expand it to other type of reactions. This will lead to very important building blocks in medicinal and pharmaceutical industry. Application of visible light opens up new and exciting possibilities of synthesizing interesting, complex molecules in an efficient and cost effective way. Such methodologies should and will be implemented, in due course, by chemical industry.