EUROPEAN COMMISSION

Community Research

BIOMACH research explores new fuelling concepts to power nanoworld machines

The EU funded BIOMACH[1] project aims to design molecular motors that provide a useable mechanical output. The long term goal is to advance the field, bringing in new fuelling, handling and using methods.

How many engines exist in modern macroscopic world, which move routinely with mechanical energy by converting the clean sun light? Even after 100 years of heavy engineering, there has been no such progress in the field. BIOMACH, one of the first STREP[2] funded under EU research Sixth Framework Programme, triumphs over newest macro-technologies by introducing new concepts and advancing research tools, to master the challenge of handling nano-engines at the single molecule level.

The BIOMACH nanotechnology project shows the principle working case for the search of new fuelling concepts for molecular motors that will be either, both technologically well established and easily available- e.g. electrons- or, environmental less polluting energy sources- e.g. sun light.

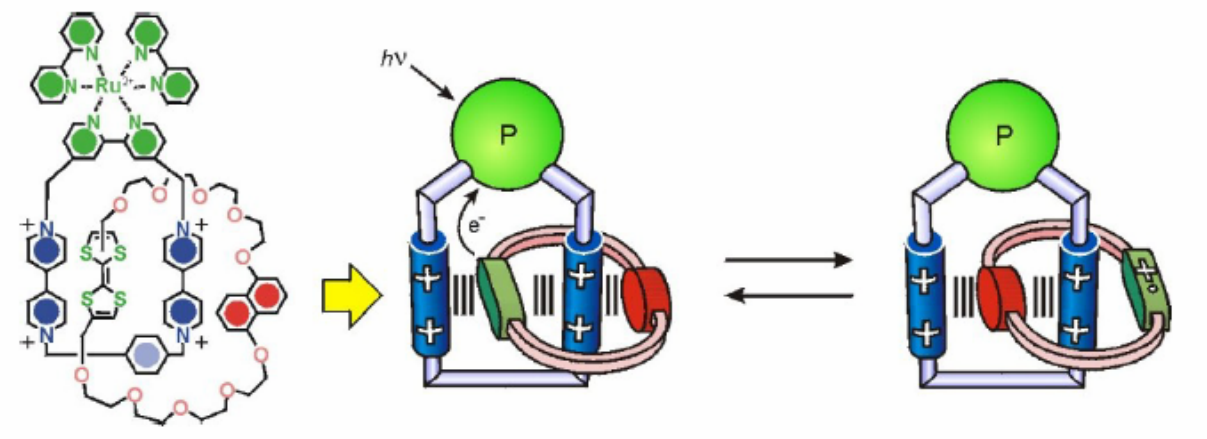

Figure: The realisation of a rotary motion by direct conversion of light into mechanical energy

[1] BIOMACH: "(Bio)Machines – Single-Molecule Handling of Biological Antecedents and Artificial Mimics" coordinated by Dr. Mario Ruben, Institute of Nanotechnology, Research Centre Karlsruhe, Germany

[2] STREP: Specific Targeted Research Projects

Creating a breakthrough in molecule handling
There is already a multitude of molecular devices working in every-day life in nature, such as photosynthesis is converting sun light in mechanical energy. These biological systems, however, tend to be too complex to be handled in technical terms. BIOMACH combines small biological working modules carrying out specific tasks into simple inorganic modules, which helps to handle and steer the systems at the single molecule level.

Resulting in better performance and usability
Future products fabricated by key methods investigated in BIOMACH proposal including chemical self-assembly of functional units and single molecule handling will contain smaller components with matching or higher performance capabilities than their traditional fabricated counterparts.

Nanotechnology to address societal benefits
Realisation of nanoscale machines, such as BIOMACH paves the way for novel devices and processes capable of reducing resource consumption and environmental pollution in manufacturing processes, bringing enormous benefits in terms of human health and quality of life. Proving the viability of this cutting-edge technology will improve European competitiveness by offering potential economic advantages including industrial growth and job-creation opportunities.

In the BIOMACH initiative, a consortium of ten European research groups will pool expertise in biology, physics and chemistry to assemble machines based on molecular building blocks.

Project Partners
- FZ Karlsruhe, GER
- University of Bologna, I
- EPF Lausanne, CH
- T U Delft, NL
- MPI Stuttgart, GER
- TU Eindhoven, NL
- ETH Zurich, CH
- Institute Curie Paris, F
- ULP Strasbourg, F
- AMOLF Amsterdam, NL

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