

An introduction to nanomotors

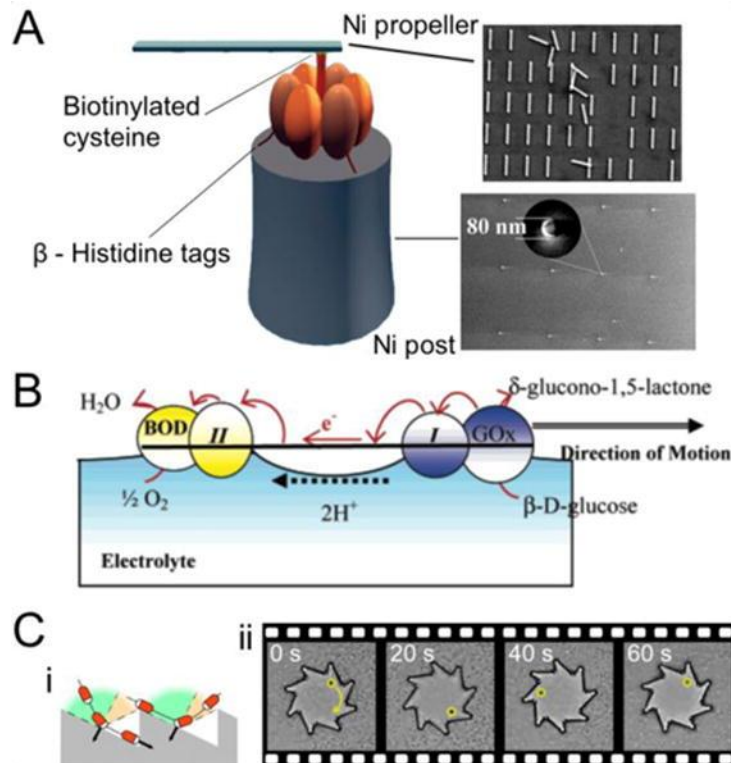
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Nano- and micromotors are “machines”, only nanometers or 10s of nanometers across, designed to perform selected mechanical movements in response to specific stimuli. These movements include rotation, rolling, shuttling, delivery, contraction or collective behavior, depending on the design of the motor and its biologically or chemically functionalized components. The advances of rotary nanomotors are pivotal for realizing dream nanomachines for myriad applications including microfluidics, budiagnosis, nano-surgery, and biosubstance delivery.

These devices are categorized according to the energy sources employed to drive the rotary motion, including biochemical, optical, magnetic, and electric fields. Biochemical powered nanomotors such as those found in biological systems, are commonly used to perform coordinated actuations, which can efficiently convert biochemical energy existing in the surrounding medium into mechanical motions and work. Optical, magnetic and electric field powered belong in the category of physical-field-driven rotary nanomotors. Compared to most types of biochemical powered nanomotors, they are advantageous in the high controllability in rotation angle, speed, and orientation. Some types of physical-field-driven nanomotors can even operate in ordered arrays at designated positions. They are also advantageous in the overall biocompatibility and facileness in device integration.

In this presentation we will be exploring the concepts, working mechanisms, design, and fabrication of nanomotors, as well as their applications in science and technology



• figure1.:

(A) A rotary nanomotor comprised of a molecular motor, a Ni propeller, and a Ni post (B) Illustration of a bioelectrochemical motor with bilirubin oxidase (BOD) and glucose oxidase (GOx) at each end of a conducting carbon fiber. (C) Ratchet microgears driven by microorganisms: (i) an illustration of the collision and sliding of the microorganisms on gears and (ii) sequential micrographs showing the rotation of a microgear.

References:

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