# Fuel-Free Nanowire Motors

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## BACKGROUND

A significant part of past work on artificial nanomotors involves catalytic nanowire motors that self-propel in the presence of a specific fuel, e.g. hydrogen peroxide. However, many applications of nanomachines require elimination of the fuel requirement.

## TECHNOLOGY DESCRIPTION

UC San Diego researchers have developed fuel-free nanomotors based on multi-segment nanowires and electric or magnetic control. Both nanomotor types are prepared using simple and scalable sequential template electrodeposition protocols. Specifically, electrically propelled nanomotors are created from Schottky barrier diode nanowires (e.g., PPy-Cd, CdSe-Au-CdSe) and are propelled/controlled by spatially uniform AC electric fields. Magnetically driven nanomotors are fabricated by sequential deposition of Au, Ag, and Ni segments in alumina micropores and subsequent dissolution steps allowing formation of nanowires with flexible joints essential for the controlled deformations, induced by external rotating magnetic fields, that enable locomotion. Proof of concept has been achieved in both cases. The relatively environment-independent, fuel-free operation of these nanomotors make them suitable for biomedical applications (e.g., targeted drug delivery) and other applications where the chemical milieu is unalterable (e.g., oil exploration).

## RELATED MATERIALS

- "Nanomotors Go Fuel-Free"
- "Bend, Spin, Swim" (*Science* magazine highlight)

## PATENT STATUS

| Country | Type | Number | Dated | Case |
|---|---|---|---|---|
| United States Of America | Issued Patent | 9,698,708 | 07/04/2017 | 2011-081 |

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## OTHER INFORMATION

### KEYWORDS

nanomotor, nanomachine, fuel-free, nanomotor control, nanomotor navigation

### CATEGORIZED AS

- **Materials & Chemicals**
  - Nanomaterials
- **Nanotechnology**
  - NanoBio
- **Sensors & Instrumentation**
  - Biosensors
  - Environmental Sensors

### RELATED CASES

2011-081-0