

# **Biomolecular motors for directed assembly and hybrid devices**

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## ABSTRACT

Biomolecular motors, such as the motor protein kinesin, convert the chemical energy stored in adenosine triphosphate with high efficiency into mechanical work. Their nanoscale dimensions and independence from external connections enables them to act as independent agents in a liquid environment, capable of performing a variety of tasks in nanotechnology, such as directed transport or active assembly and disassembly. The integration of such nanoengines into nanodevices and multifunctional materials raises a host of intriguing engineering questions, some related to the biological origin of the motors and others of general relevance to the field of molecular motors. One example is the balance between external control and self-organization in these multi-agent systems. Other questions are related to the achievable gains in required energy, the limits of power density, or the prediction of device and material characteristics. Finally, fundamental research has to be complemented by work directed towards applications. Our increasing experience with the integration of biomolecular motors into synthetic devices and the expanding knowledge about the biological functions of motor proteins sharpen the focus on the uniqueness and feasibility of application ideas related to, for example, biosensors and advanced materials.