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Microscope-free operation of macroscopic devices based on molecular motors

Initiative: Integration molekularer Komponenten in funktionale makroskopische Systeme (beendet, nur noch

Fortsetzungsanträge)

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Laufzeit: 3 Jahre

Recent advances in the biophysical understanding of cytoskeletal motor proteins, as well as the development of methods to externally control their activity, have raised the possibility of using molecular motors as robust, efficient and cheap nanomachines in synthetic environments. However, so far the detection of these gliding filaments, and the readout of the results of molecular devices, has exclusively relied on bulky microscopic setups. Thus, one of the distinct advantages of molecular-scale devices namely their small size is ultimately lost. The proposed project aims to design and test strategies to detect and quantify the activity of biomolecular transport systems in a manner that is microscope-free and allows for direct interfacing with digital electronics. In particular, the kinesin-microtubule transport system will be probed with highly-localized, nanoscopic check points and read out, in real time, the presence of filaments as electrical signals or opto-electrical signals. As a result of this project, significant advances in the development and testing of novel sensor systems are expected, as well as in a new class of miniaturized, microscope-free protein detection systems relevant for large-scale and high-throughput biocomputation and point-of-care molecular-diagnostics applications.

Projektbeteiligte

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Open Access-Publikationen

Prospects for single-molecule electrostatic detection in molecular motor gliding motility assays
Prolonged function and optimization of actomyosin motility for upscaled network-based biocomputation
Roadmap for network-based biocomputation
Solving the 3-Satisfiability Problem Using Network-Based Biocomputation