

Biography of Prof. Dr. Andreas Fery

Prof. Dr. Andreas Fery, Leibniz-Institut für Polymerforschung Dresden e. V. (IPF), Germany, is a researcher in the field of physical chemistry and polymer physics with a strong academic background and extensive expertise in the understanding and synthesis of colloids and interfaces, the rational design and assembly of polymer-based and nanostructured materials, and their integration into devices for sensing, bioelectronics, optoelectronics, and energy applications. His contributions to colloids and interfaces, particle-based materials, and plasmonics have attracted more than 20.000 citations with H-index of 80 (Google Scholar, October 2026). Amongst other functions, Prof. Dr. Andreas Fery serves as deputy spokesperson for for the Excellence Cluster (EXC) 3035 "Responsible Electronics in the Climate Change Era (REC^2)" (since 2026) and spokesperson for the Leibniz Research Alliance "Advanced Materials Safety" (since 2022).

In 2000, Prof. Dr. Andreas Fery completed his doctorate in physics of condensed matter, University Potsdam/Max-Planck Institute for Colloids and Interfaces, Germany. Following his PhD, he worked in postdoctoral positions at Max-Planck Institute for Colloids and Interfaces, and Institute Curie, Paris, France. In 2006, he completed his habilitation in the field of physics of interfaces at the University of Potsdam. He subsequently became an associate professor and later a full professor in physical chemistry at the University of Bayreuth, Germany. He currently serves as division director for physical chemistry and physics of polymers at the Leibniz-Institut fuer Polymerforschung Dresden e. V. (IPF) and further holds a professorial appointment at Technical University Dresden (TU Dresden).

From polymer grafting to messenger materials and sustainable metamaterials

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Polymer surface modification offers unique possibilities for creating interactive and functional materials. Polymer grafting in particular can be employed for nanoscale control both on macroscopic surfaces and for nanoparticles and I will discuss the implications for self-reporting surfaces and metamaterials.
Polymer brush surfaces that alter their physical properties in response to chemical stimuli have the capacity to be used as so called Messenger materials. These materials translate local physicochemical changes into spatially-resolved modulation of fluorescence [1]. This approach can be used for unraveling contact mechanics and friction in complex scenarios as well as clarify mechanisms acting in responsive and adaptive surface coatings.
Polymer modification of nanoparticles results in hairy nanoparticles, which find a range of applications in functional materials [2]. Especially metallic nanoparticles offer a number of interesting optical and electronic effects due to their localized surface plasmon resonance (LSPR) Adding a functional polymeric shell does not only allow controlling inter-particle distances but as well tailor transport / electronic couping. [2,3] Increasing the level of complexity, the ordering of particles at different length scales opens another powerful routes to optical and electronic functionality due to novel collective plasmonic excitations arising from plasmonic coupling effects. We focus on achieving such ordered particle arrays through self-assembly approaches. Colloidal self-assembly can indeed yield well-defined colloidal clusters and surface arrays in which coupling effects can be controlled. In particular, large-scale assemblies are possible in combination with biomimetic surface patterning like controlled wrinkling. We discuss the underlying physicochemical principles of the structure formation process and the resulting plasmonic coupling effects including chiroplasmonic metamaterial effects [4,5]. Finally, we present perspectives on how these assembly principles can be relevant for developing circular economy approaches for advanced materials.

Keywords: polymer brushes, messenger materials, plasmonics, circular dichroism, metamaterials, particle based materials, circular materials

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