PRESS RELEASE

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Optimized analytics reduce “false negatives” in the detection of nanoparticles

Many everyday products and our environment contain nanoparticles, and there is increasing interest in finding them. The particles and their sizes are commonly detected using specialized analytical techniques. If nanoparticles are lost in the analytical apparatus, they are not detected, and a “false negative” result occurs. The INM – Leibniz Institute for New Materials has joined forces with a manufacturer of analytical equipment to reduce particles losses and avoid false negatives. They developed reference nanoparticles and used them to investigate how the analysis can be improved.

In project DINAFF, researchers at INM and Superon GmbH managed to reduce the loss of nanoparticles during analysis and, therefore, to improve the limit of detection. The researchers modified the inner surface of the analytical apparatus, optimized measurement parameters such as flow speed, and tuned the surface properties of the target nanoparticles.

“We worked with so-called tracer particles for our analyses,” Tobias Kraus from INM explained. “These are nanoparticles that we deliberately add to each sample. We therefore know that we should be able to find these particles in the sample. If we do not find them, something during the analysis impedes detection and causes a false negative.” Parameters of the analytical method then have to be adjusted so that the tracer particles become detectable. The head of the *Structure Formation* group continued: “The more similar our tracer particles are to the real nanoparticles, the more reliably the real nanoparticles can be detected later.”

The researchers applied the so-called AF4 Method to detect nanoparticles. In this method, nanoparticles are lost when they adhere to tubing or other internal surfaces of the apparatus and no longer arrive at the detector. Nanoparticles may also form clumps that are so large that the detector no longer responds to them. “Preventing these two main causes of false negatives requires a combination of suitable tracer particles, the right analytical method, and optimized parameters,” Kraus says.

In the future, the researchers will offer their expertise in all three areas to interested parties from industry. They will provide the synthesis of tracer particles, consultation regarding analysis of the industrial partners, and particle analysis as a service at INM.

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Background:

"DINAFF – Detection and Identification of Nanoparticles" is a project funded by the central innovation program for SMEs ("ZIM"). The project is coordinated by AiF Projekt GmbH, Berlin. DINAFF received subsidies of 175,000 euro from the German Federal Ministry of Economic Affairs and Industry. The project ended in December 2015. Partners in the cooperation were the INM – Leibniz-Institute for New Materials, Saarbrücken and Superon GmbH, Dernbach.

AF4 stands for "asymmetrical-flow-field-flow fractionation". In this method, the liquid test sample is separated over a semi-permeable membrane: Nanoparticles are separated according to size by various flow currents and directions and are detected in different detectors.

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INM conducts research and development to create new materials – for today, tomorrow and beyond. Chemists, physicists, biologists, materials scientists and engineers team up to focus on these essential questions: Which material properties are new, how can they be investigated and how can they be tailored for industrial applications in the future? Four research thrusts determine the current developments at INM: *New materials for energy application*, *new concepts for medical surfaces, new surface materials for tribological systems* and na*no safety and nano bio*. Research at INM is performed in three fields: *Nanocomposite Technology*, *Interface Materials*, and *Bio Interfaces*.

INM – Leibniz Institute for New Materials, situated in Saarbrücken, is an internationally leading center for materials research. It is an institute of the Leibniz Association and has about 220 employees.