What happened to the hyped nanomaterials?

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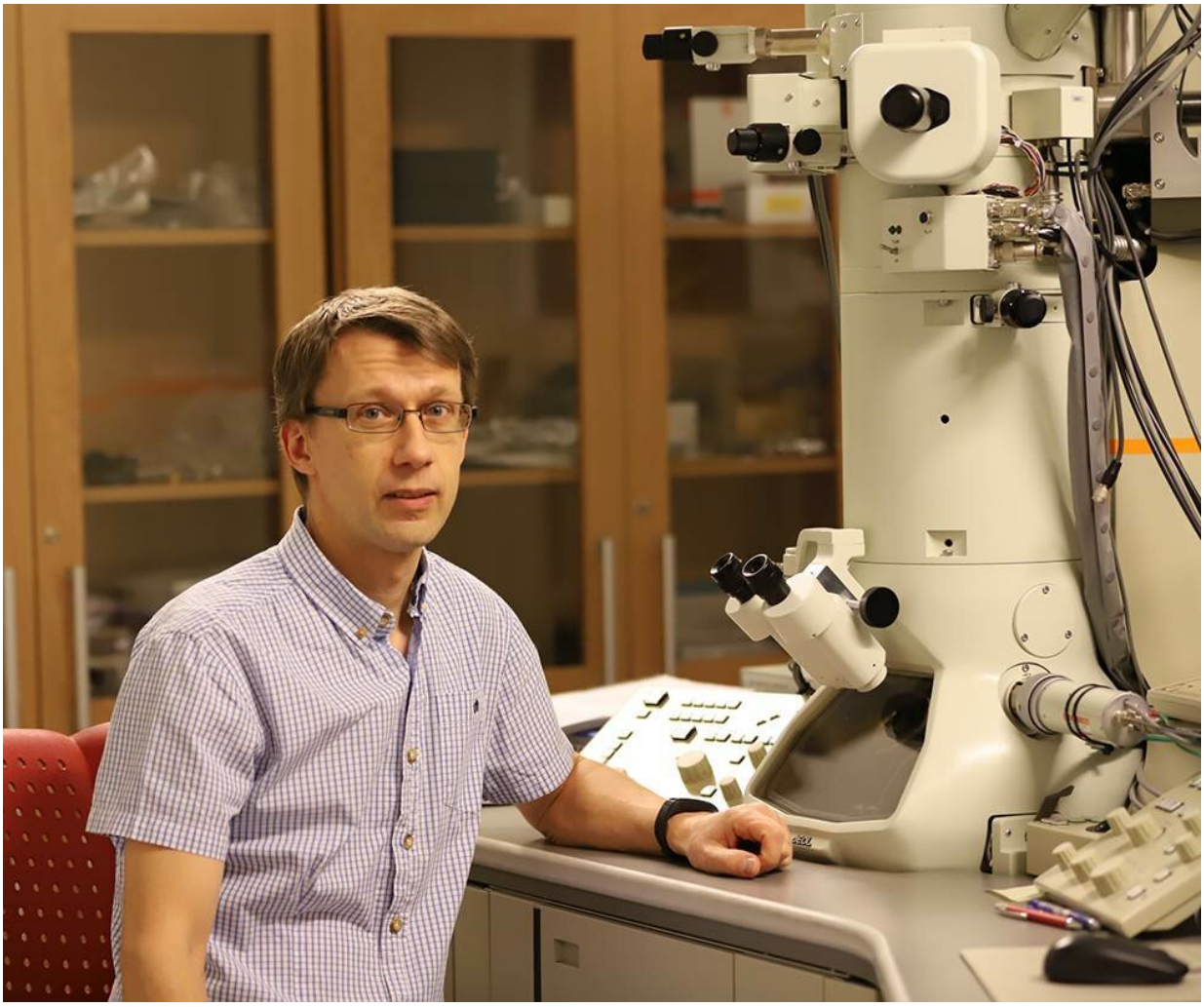

Krister Svensson, associate professor of physics. Credit: Karlstad University

Carbon-based nano materials such as graphene and carbon nanotubes

were predicted to have a brilliant future when they were discovered. But quality problems curb the development of new products. The problem is that it is difficult to analyse the crystal structure and there are no established standard methods for classifying the materials. But now, researchers at Karlstad University are close to a solution.

"Carbon atoms must sit perfectly in a well-organised crystal structure at precise distances, but they don't in the commercially available materials on the market today," says Krister Svensson, associate professor of physics.

Quality problems in nano materials curb development

The first studies of carbon nanotubes were made nearly 30 years ago, without yet meeting the high expectations for applications. The reason for this is largely the failure to scale up the manufacturing process while retaining a high quality.

As the properties of the material depend on the crystal structure, the quality of the material is absolutely crucial to the performance of the final product.

"The problem is complicated by the fact that it is difficult to analyse crystal structure and that there are no established standard methods for classifying the materials," says Krister Svensson. "This has led to a kind 'Wild West' situation on the market in terms of prices and quality of the materials on sale."

There is now a risk that inferior materials on the market are ruining the prospects of serious actors and interest in the material may wane fast. Then a hype is all there is and the point of real application is never reached.

"We have now developed a method to characterise material crystallinity and we can also demonstrate the detrimental effects that low crystallinity has on mechanical properties," says Krister Svensson. "It is quite obvious that the commercially available material fails to live up to expectations, it's simply a different material. Vigorous efforts to put a stop to 'fake' materials and develop standardised measuring methods and classifications of materials are required. Not until then can the market be ready to develop new products for the various material classes."

The project was carried out by Krister Svensson, associate professor, and Mattias Flygare, doctoral student, in the research group CMM, Characterizing and Modelling of Materials at Karlstad University and presented in the journal *Materials Today Communications* (March 2019).

More information: Mattias Flygare et al. Quantifying crystallinity in carbon nanotubes and its influence on mechanical behaviour, *Materials Today Communications* (2018). DOI: 10.1016/j.mtcomm.2018.11.003

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