

Date: 20 May 2022 Ref.: 3.2-21 0149

Decision on research misconduct

Decision

The Swedish National Board for Assessment of Research Misconduct ("the Board") finds

not guilty of research misconduct.

Background

On 15 November 2021, the Board received anonymous allegations of research misconduct. These allegations relate to fabrication of data in the following four articles, published in the years 2018–2021 by researchers at Linköping University and Chalmers University of Technology:

- 1. "Complementary Logic Circuits Based on High-Performance n-Type Organic Electrochemical Transistors", *Advanced Materials* 2018, 30, 1704916.
- 2. "A high-conductivity *n*-type polymeric ink for printed electronics", *Nature Communications* 12, 2354 (2021).
- "Synergistic Effect of Multi-Walled Carbon Nanotubes and Ladder-Type Conjugated Polymers on the Performance of N-Type Organic Electrochemical Transistors", *Advanced Functional Materials* 2021, 2106447.
- 4. "Influence of Molecular Weight on the Organic Electrochemical Transistor Performance of Ladder-Type Conjugated Polymers", Advanced Materials 2022, 34, 2106235.

The complainant alleges that a range of physical measuring data, on viscosity and capacitance, in the polymeric ink (BBL) studied in the four articles, is fabricated. One reason for the allegation is that the results partially differ among the publications, but the complainant also claims to have found the resulting measurements irreproducible. Besides the measurement data reported in all the articles, the complainant also calls



into question results reported in Article 3 regarding the electrical properties of the transistors with geometric variability that are manufactured (printed) with BBL.

All co-authors of the articles have had the opportunity to express their views, in writing, in response to the allegations.

Their opinion is that the suspicions of fabrication entirely lack any foundation, and that it would have been better if the differences in results cited in the allegations had been discussed in a scientific context.

They clarify the fact that the viscosity of BBL is measured to estimate the relative molecular mass of the material. Moreover, they explain that since the BBL was produced at different laboratories and under varying conditions for the various articles, it was to be expected that the properties of the material would diverge to some extent. One reason for this is that the various raw materials used to synthesise BBL differ in terms of purity. Regarding measurements of the capacitance of the material, too, the alleged offenders provide a similar explanation. They clarify the fact that capacitance depends on numerous factors that, in turn, account for the differences in measuring data.

They state that the BBL on which the results reported in Articles 2 and 4 were based is available for further analysis. They have also given the Board access to some raw data that served as the basis for the results in Articles 1, 3 and 4. Finally, they also explain the background to the results in Article 3 that were called into question by the complainant.

has submitted a statement of his own. He explains that he took part in the work for Article 2, where his contribution related to aspects other than those concerned in the allegations. He expresses great confidence in his fellow authors and states his view that the allegations are groundless.

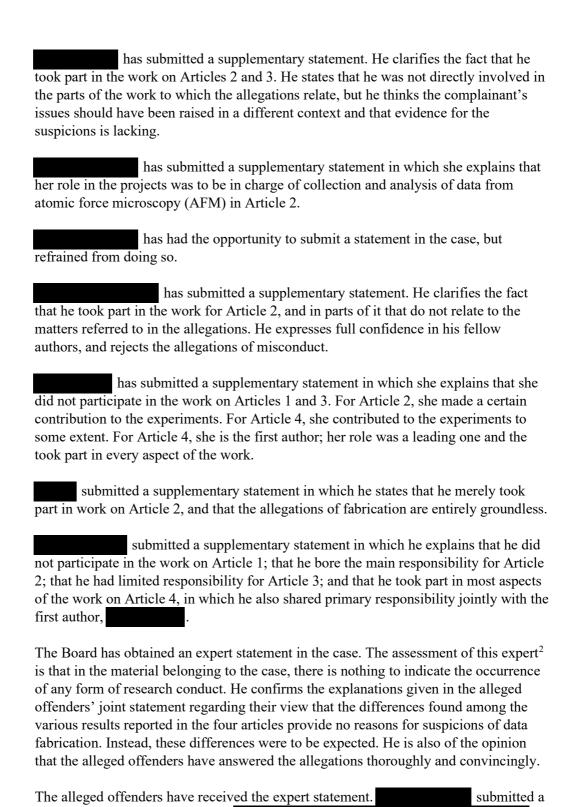
, too, has submitted a statement of his own. In it, he clarifies his role as third author of Article 1, and declares that his work for this article does not involve the parts referred to in the allegations. He points out that he has seen no reason to suspect research misconduct in the project.

has subsequently added to the co-authors' joint communication a statement by an independent expert¹ appointed by Linköping University who, after examining the material in the allegations. rejects any suspicion of research misconduct.

has submitted a supplementary statement. He clarifies the fact that he took part in the work on all four articles. He relates that he contributed to the design of the projects and to the task of composing the articles.

¹ Professor Ullrich Scherf, University of Wuppertal, North Rhine-Westphalia, Germany.





statement that was also signed by

² Professor Federico Rosei, INRS, University of Quebec, Canada.



They support the expert's statement, and point out that the allegations have now been investigated by two well-established international experts in their research area, both of whom clearly reject all the allegations of research misconduct.

Grounds for decision

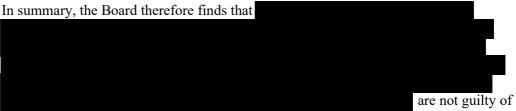
Legal regulation

The Board's remit is to examine issues of research misconduct under the Swedish Act (2019:504) on responsibility for good research practice and the examination of research misconduct ("the Act"). Section 2 of the Act defines research misconduct as a serious deviation from good research practice in the form of fabrication, falsification or plagiarism, committed with intent or through gross negligence, in the planning, conduct or reporting of research.

Fabrication, falsification or plagiarism

The Board's remit is to examine three forms of misconduct: fabrication, falsification and plagiarism. The Act does not define these terms, but its preparatory legislative work refers to the fact that they are described in codes (codices) and guidelines on research ethics, such as *The European Code of Conduct for Research Integrity* (ALLEA).^{3, 4} The principles are also explained in the Swedish Research Council's publication *Good Research Practice*.⁵ According to the preparatory legislative work, "fabrication" is often described as inventing results and documenting them as if they were genuine. "Falsification" refers to manipulation of research material, equipment or processes, or unjustified alteration, omission or suppression of data or results.

The suspicions of fabrication lack support in the documents included in the case. According to the expert, there is a simple explanation for the differences in the measuring results among the various articles, and there is no reason whatsoever to suspect that any fabrication of data has taken place. The Board has arrived at the same assessment as the expert: that the allegations of fabrication are unfounded and that the alleged offenders can thereby be freed from suspicions of research misconduct.



research misconduct.

³ The European Code of Conduct for Research Integrity, revised edition. Berlin: All European Academies (ALLEA); 2018, Section 3.1.

⁴ Swedish Government Bill 2018/19:58, pp. 45, 100.

⁵ Good Research Practice. Stockholm: Swedish Research Council, 2017, Chapter 8.



The Board has decided in this case following a presentation by caseworker Sofia Ramstedt.

Thomas Bull Chair Sofia Ramstedt Caseworker