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Report on Habilitation thesis - Dr. Burkhard Horstkotte

The main topic of Dr. Burkhard Horstkotte Habilitation thesis is the flow-based technique denoted as Lab-In-Syringe (LIS). In fact, Dr. Burkhard Horstkotte was a co-developer of the LIS technique, which has been in use since its invention 11 years ago. This technique has been disseminated to nine research groups working in automation in seven different countries, which accounts for the impact in the scientific community working in this area and the applicability of this original creation to different contexts.

In fact, this aspect is clearly exploited in the document, where a focus is given to the role of LIS in sample preparation. The candidate has shown through his contributions how versatile the technique is in addressing the step that requires more time and resources during the analytical process: the sample treatment. Different strategies were presented and discussed, ranging from liquid-liquid to solid-liquid (micro)extraction hyphenated to different detectors or to other separative techniques. It is important to emphasize that all information is accompanied by clear images and schemes, which facilitates the reader interpretation and also hints to the pedagogical skills of the candidate.

The Habilitation thesis is also clearly structured, and it has been written in a high-level scientific language. It has been organized in 9 chapters, starting with a first section (Chapters 1-2) that contains an introductory note and the objectives of the work. The second section (Chapter 3) contains a detailed description of the theoretical aspects associated to the proposed topic, namely laboratory automation through flow-based techniques, focusing on automated extraction of analytes, particularly using the Lab-In-Syringe technique. The third section (Chapters 4-5) is focused on the contributions made by the candidate that selected the Lab-In-Syringe technique to address different analytical challenges, including solvent- and stirring-assisted dispersive liquid-liquid microextraction, single drop microextraction, and solid-phase extraction. Most importantly, the Habilitation candidate has critically discussed the selected works in Chapter 5 in an innovative way, proposing questions and answers according to the state-of-the-art. These three sections were complemented with a Summary (Chapter 6) and a Conclusion (Chapter 7), followed by 313 references and the indication of the candidate contribution to the contemplated works using the CRediT (Contributor Roles Taxonomy) system. The document is clearly original, which has been validated through the received originality report, offering a total similarity index of 23%, with values <3% when considering a single source. Although these values might seem high, they refer mainly to the references section and to the candidate articles mentioned in Chapter 9.

The work reported in Dr. Burkhard Horstkotte Habilitation thesis has been scrutinized and well received by the scientific community through the publication of an exceptional number of papers in scientific journals with high impact factor and from reputed Publishers, including Elsevier and Springer-Nature (namely in the journals Talanta (8), Analytica Chimica Acta (7), Analytical Chemistry (2), Trends in Analytical Chemistry (2), Journal of Chromatography A, Microchimica Acta, among others). All these examples belong to the first quartile of the Analytical Chemistry category (ISI WoK), attesting the excellence and impact of the scientific work. There is a clear evolution of the candidate's role in the development of the corpus of work, beginning as the first author and responsible for experimental work, and evolving to a senior role as corresponding and/or last author.

As a final consideration, the present document is not a mere compilation of technical aspects concerning LIS, it gives us a personal view of the field regarding automation using flow-based techniques, based on ideas from different currents/groups working in the area, brought together as an in-depth critical discussion. For all these reasons, I believe the Habilitation thesis is at a very high level regarding international scientific standards.

Porto, May 2, 2023

Assinado por: **Marcela Alves Segundo**
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