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The Potential of Stainless Steel Needles to Integrate Microextraction and Mass Spectrometry

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Summary

Sustainability and affordability are relevant features of novel microextraction devices. On the one hand, the use of sorbent materials derived from renewable or natural sources is relevant to minimize the environmental impact of the sample preparation step and, thus, of the whole analytical procedure. In addition, considering the affordability of the elements as a criterion in the design of these units helps to improve their transferability, given their low cost and ease of implementation in any laboratory, regardless of its economic resources. The fact that these elements are available on the market is an added value as it leads to a higher reproducibility of the extraction devices.

In this context, we have investigated the potential of stainless-steel needles (SS-Ns) as sorbent hosts. Their easy combination with syringes facilitates the construction of a very versatile microextraction device, since it can be easily adapted to the sample volume to be analyzed simply by selecting the appropriate volume of the syringe. Disposable plastic syringes can also be used to avoid cross-contamination between samples. The conductivity of stainless steel allows it to be used as an electrospray emitter in ambient mass spectrometry. This last combination simplifies the whole analytical procedure, as the on-line elution of the retained analytes is efficiently transferred to the mass spectrometer inlet.

This communication describes the applications developed by our research group using SS-Ns where the sorbent phase is either placed as a thin film coating the inner wall of the needle or placed in the holder. The determination of drugs in biological fluids has been selected as the analytical problem. The different sorbents used are sustainable (e. g., cotton, polydopamine), and the interface with the mass spectrometer was made up of commercial elements [1,2].

Acknowledgement

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References

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[2] J. Millán-Santiago, R. Lucena, S. Cárdenas, Bioinspired composite packed in blunt needles, integrated microextraction and determination of oxycodone and naloxone in saliva by substrate spray mass spectrometry, Anal. Chim. Acta 1297 (2024) 342376.