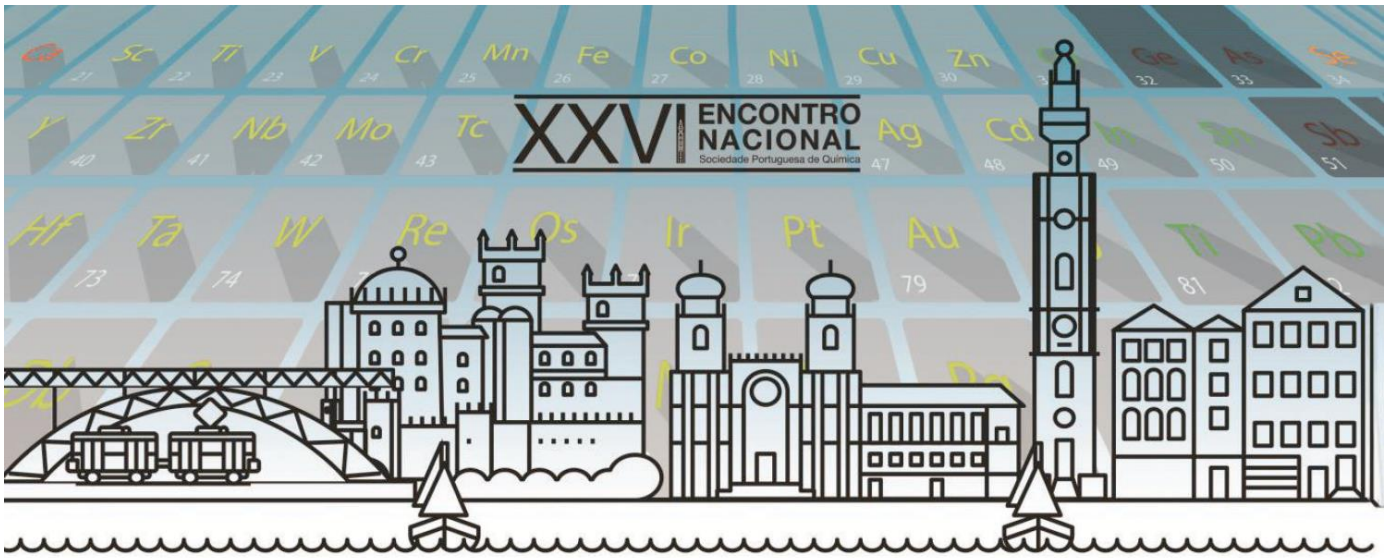

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Health

Quantification of salivary magnesium using a microfluidic paper based analytical device (µPAD)

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Magnesium is a mineral present in the human body involved in several physiological processes, namely acting as a cofactor in more than 300 enzymatic reactions. It allows the proper functioning of the enzymes enabling several reactions in the body. In this context, due to the importance of this mineral for human health, its concentration for each tissue/fluid must be monitored; otherwise, there could be a case of magnesium deficit (hypomagnesemia), or excess of magnesium (hypermagnesemia). [1]

The magnesium cation is present in the saliva at about 0.2 mM. However, some studies show that certain pathologies/disturbances, namely cystic fibrosis and burning mouth syndrome,[2] may be associated with alterations in the concentration of the salivary magnesium. Thus, its quantification in saliva can be an indicator of those pathologies.

Microfluidic paper-based analytical devices (µPADs) have several benefits that make them ideally suited to conduct in-situ, on-hand determinations. While many of the current monitoring techniques require specialised skills, laborious laboratory processes, or/and expensive equipment, µPADs provide a quick and cheap analytical result. Additionally, the low-cost, easy-disposable and intrinsic portability of the µPADs, make them ideal devices for regular monitoring i.e. routine consultation.

In this context, the objective of described work was to design a µPAD for a fast, in-the moment, reliable magnesium quantification in human saliva (**Figure 1)**. The method was based on the reaction between magnesium and eriochrome cyanine dye, generating a coloured complex, quantified through pixel readings. The overall consumption of both reagents and sample is rather low. The developed µPAD enables to determine the salivary magnesium concentration as an economical and in-situ alternative to be used by unskilled operators.

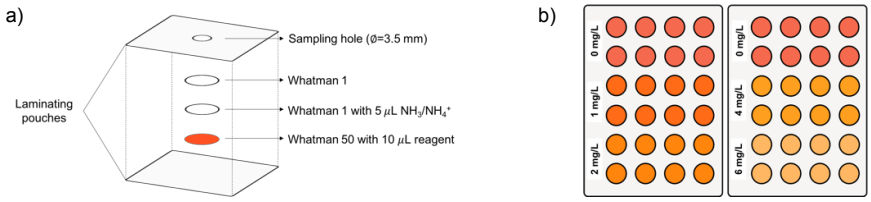

Figure 1: Schematic representation of developed µPAD: a) exploded view of the assembly; b) colour scheme of the calibration curve.

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