RETASTE Conference Abstracts
Vol. 1 RETASTE-TFM-87
Athens, Greece, 6-8 May, 2021

Effective Tools to Reduce Domestic Food Waste: Bio-Based Dual Sensors Devices for Naked-Eye Freshness Monitoring of High-Protein Foods

[1]Lisa Rita Magnaghi, [1]Gabriella Maria Simone, [2]Camilla Zanoni, [1]Giancarla Alberti, [1]Paolo Quadrelli and [1]Raffaela Biesuz

[1]*Department of Chemistry, University of Pavia, Viale Taramelli 12, Pavia, Italy*
[2]*Department of Chemistry, University of Pavia, Viale Taramelli 12Department of Chemistry, University of Pavia, Viale Taramelli 12, Pavia, Italy, Pavia (Italy)*

Abstract

One-third of food produced for human consumption every year is lost or wasted and, in Europe, 53% of food waste occurs in households. For this reason, food waste represents an increasing issue nowadays that could no longer be neglected and any efficient policy to face this problem must involve the entire food supply chain, from the producers to the households. Domestic food waste is in part attributed to date labels since they are calculated according to the worst storage scenario and their meaning is often misunderstood by consumers. As a result, date labels may lead consumers to waste foods still safe for human consumption, thus provoking an unjustified loss of food and money. This issue can be solved by the introduction of smart labels, able to detect the real freshness of foods, rather than calculating it, basing on the average perishability or storage conditions. Countless devices have been recently proposed for this application but most of them usually fail the test of real samples freshness monitoring or large-scale applicability. With a specific focus on solid protein foods, like fish or meats, our research group developed several sensors array suitable for the application as naked-eye smart labels, when placed over foods: the receptors used are pH indicators that turn their colour in a wide pH range, able to detect volatile spoilage by-products with different acid-base behaviour, while several solid supports and linkage mechanism have been tested, ranging from ion exchanger to covalently modified polymers (Magnaghi et al., 2020). To further increase the biocompatibility and sustainability of these devices, a new series of bio-based sensors, whose main components are cellulose, starch, glycerol and carboxymethylcellulose, properly functionalised with the reactive dyes of interest, have been developed and optimised using a multivariate approach. The result is a portfolio of dual sensors arrays, suitable to identify the different spoilage steps of protein foods during storage at home conditions. The shift from plastic-based to bio-based films allowed us to widen the range of devices without losing the key points of reliability, resistivity, naked-eye evaluation and large-scale applicability.

Keywords: domestic food waste, bio-based materials, colourimetric sensors, smart labels, chemometrics

References

Magnaghi, L. R. et al., 2020. Foods, 9, p.684 https://doi.org/10.3390/foods9050684
Magnaghi, L. R. et al., 2020. J. Agric. Food Chem., 68 (45), p.12702-12709 https://doi.org/10.1021/acs.jafc.0c03768
Magnaghi, L. R. et al., 2020. J. Agric. Food Chem., 68 (45), p.12710-12718 https://doi.org/10.1021/acs.jafc.0c03771
Magnaghi, L. R. et al., 2020. ACS Food Sci. Technol., https://dx.doi.org/10.1021/acsfoodscitech.0c00089