PIGE ANALYSIS OF FLUORINE IN MATERIALS FOR THE CIRCULAR ECONOMY

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Per- and polyfluoroalkyl substances (PFASs) are highly persistent synthetic chemicals, some of which have been associated with cancer, developmental toxicity, immunotoxicity, and other health effects. PFASs in grease-resistant recyclable food packaging can leach into food and increase dietary exposure and can also contribute to environmental contamination during production and disposal.

Samples of food paperboard containers and beverage containers from canteens and restaurants throughout Italy were collected and the total fluorine content was measured using particle-induced γ-ray emission (PIGE) spectroscopy at the LABEC ion beam laboratory of INFN in Florence, Italy. The measurements were carried out using a 4 MeV proton beam extracted into ambient atmosphere and detecting the characteristic γ-rays at 197 keV emitted from the de-excitation of ^{19}F in the $^{19}F(p,p'\gamma_{2\text{-}0})^{19}F$ reaction.

This study demonstrates how external beam PIGE can be very useful for rapidly measuring total fluorine in as-is solid samples, without any pre-treatment.