L-17 CHARACTERISATION OF TITANIUM DIOXIDE IN FOOD AND FOOD ADDITIVES

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The Netherlands. Titanium dioxide is a common food additive and registered in the EU as E171. As a pigment, titanium dioxide is used to enhance the white colour of certain foods, such as dairy products and candy. It also lends brightness to toothpaste and some medications. Not much is known on the titanium dioxide content and the nano-sized fraction therein, in foods and consumer products. In this study the size distribution of a series of synthetic, food grade titanium dioxide additives (pure E171) is determined using scanning electron microscopy (SEM), asymmetric flow field-flow fractionation with inductively coupled plasma mass spectrometry (AF4–ICPMS), and single particle ICP–MS (sp–ICPMS). In this study 7 food-grade TiO2 materials, 24 food products and 3 toothpastes were investigated for their titanium dioxide content and the size distribution of these titanium dioxide particles. Analyses with SEM showed that the food-grade TiO2 materials are very much alike and have similar size distributions with primary particles in the range of 60 to 300 nm. About 10% of the particles in these materials had sizes below 100 nm. Of the 27 food and personal care samples that were tested, 24 showed detectable amounts of titanium while 19 products showed amounts of titanium higher than 0.1 mg Ti/g product. The highest concentration was found in a chewing gum that contained 5.4 mg Ti/g product which translates to 9.0 mg TiO2/g product. There was a good correlation between the TiO2 content in the products as determined with AF4–ICPMS and the total-titanium content of the product. Number-based size distributions were determined directly from the sp–ICPMS analysis and indirectly (after transformation from mass-to-umber-based) from the AF4-ICPMS analysis. It was found that the number-based-size distributions determined for TiO2 particles in the food and personal care products are comparable with those found for the food-grade TiO2 materials with the same method. The number of particles with sizes below 100 nm in the food and personal care products was around 10%, comparable with the results found for the TiO2 materials with SEM as well as with AF4–ICPMS and sp–ICPMS. Since this size distribution is expressed on a particle number basis, it allows us to decide whether the studied food additives should be labelled as a nanomaterial according to the recommendation of the definition of a nanomaterial (2011/696/EU).

Keywords: Nanoparticles, titanium dioxide, electron microscopy, field flow fractionation, single particle ICPMS.

L-18 DETECTION AND CHARACTERIZATION OF SILVER NANOPARTICLES IN CHICKEN MEAT

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With the increasing use of nanotechnology in food and consumer products, there is a need for reliable detection and characterization methods for nanoparticles (NPs) in complex matrices. Asymmetric flow field-flow fractionation (AF4) coupled to inductively coupled plasma mass spectrometry (ICP–MS) is a highly promising method for this purpose. However, the number of publications regarding sample preparation of NPs in organic matrices including food stuffs, tissues and cells for AF4–ICP–MS is still limited. Silver nanoparticles (AgNPs) are presently one of the most frequently used nanomaterials in consumer products related to food, such as food storage containers and dietary supplements. In the presented work AgNPs were incorporated into chicken meat to illustrate a possible scenario where AgNPs may migrate from an antibacterial food contact material into meat. A method of analysis was developed based on enzymatic digestion followed by AF4-ICP–MS fractionation and detection. The method was validated in terms of precision, reproducibility, linearity and limit of detection / quantification. In addition, single particle ICP–MS was applied for determination of the number-based particle size distribution of AgNPs in collected fractions. The talk will describe which methodological steps were necessary, and highlight the challenges that had to be addressed, in order to develop an appropriate sample preparation method for AgNPs in meat.

Keywords: Silver nanoparticles, food, field flow fractionation, single particle ICP–MS, enzymatic digestion

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