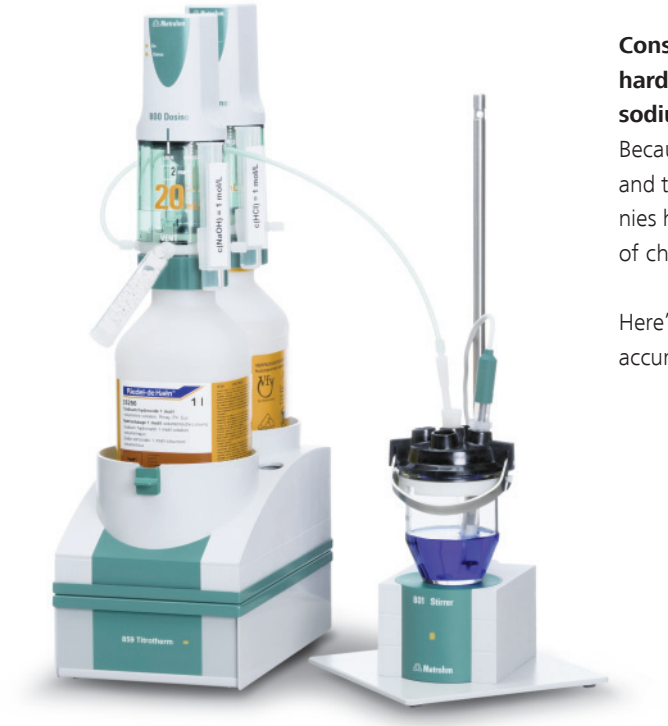
Know the «True» Sodium Content



Consumers and regulatory agencies are pushing harder than ever for the accurate analysis of sodium in food products.

Because direct measurement methods have been cost- and time-prohibitive for testing labs – many food companies have indirectly analyzed sodium through the analysis of chloride – but this can yield highly inaccurate results.

Here's a fast and economical direct-testing method to accurately measure sodium content.

Metrohm

Analysis of Sodium in Foodstuffs by Thermometric Titration

Sodium has traditionally been indirectly tested using a silver nitrate precipitation reaction:

$$AgNO_3 + Cl^- \rightarrow AgCl \downarrow + NO_3^-$$

The amount of sodium is typically calculated by assuming a 1:1 molar ration of chloride ions to sodium ions in the food. This is not necessarily the case when common sodium-containing food ingredients, such as sodium benzoate and monosodium glutamate, or chloride-containing ingredients such as potassium chloride, are present in the food matrix – as well as sodium ions that may be present in the food itself.

Common methods of testing the true amount of sodium directly have typically been atomic absorption spectroscopy or inductively coupled plasma spectroscopy. Although specific to sodium for analysis, these techniques typically involve significant capital investments in equipment and infrastructure, costly ultra-pure reagents and lengthy sample preparation and system calibration.

Metrohm is excited to announce a method of direct thermometric titration of sodium in foodstuffs that is specific, rapid, robust and economical:

Thermometric titration is a form of titration using either the heat of enthalpy produced by a chemical reaction to determine its endpoint. This method of titration is free from the electrochemical and solvent effects that are present in many types of titration making them difficult to adapt to some food matrices. To determine the amount of sodium the food is first masticated or homogenized to make a homogeneous mixture. The prepared mixtures is then titrated with a standardized solution of aluminum containing a stoichiometric excess of potassium ions in the presence of ammonium hydrogen difluoride at ~pH 3 to give an exothermic reaction, forming insoluble NaK_2AlF_6.

$$Al^{3+} + Na^+ + 2K^+ + 6F^- \leftrightarrow NaK_2AlF_6 \downarrow$$

The titrant is standardized against a solution prepared from anhydrous sodium sulfate.

Instruments and Accessories

Equipment Required	859 Titrotherm
Reagents Required	Titrant: Mixed 0.5 mol/L $Al(NO_3)_3$ = 0,5 mol/L and $c(KNO_3)$ = 1,1 mol/L.
	Complexation reagent: 300 g/L $NH_4F \cdot HF$
	Waste neutralization solution: Saturated boric acid solution

Experimental Results

Sample I.D.	ICP Average Sodium %	Titrotherm Average Sodium %	RSD
Ketchup	1.3	1.3	0.008
Yellow Mustard	0.9	1.2	0.005
Green Beans	0.2	0.3	0.011
Jamaican Jerk Seasoned, Potato Chips	0.4	0.6	0.113
Mini Prezels	1.1	1.0	0.078

Discussion of experimental results:

Thermometric titration has been shown to be robust, accurate and very precise. The results achieved with the 859 Titrotherm demonstrate that a titration using very simple and rapid sample preparation will allow the user to analyze sodium directly in a food sample.

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Subject to modifications
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