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The determination of total nitrogen in liquid milk

As the Kjeldahl method involves use of highly corrosive and hazardous chemicals at high temperature it is strongly recommended to use protective glasses and gloves. The safety sections in the KjelROC Operation Manuals should be read before starting any analysis work.

INTRODUCTION

Protein determination is one of the key analyses performed in the food industry. The samples require digestion with sulfuric acid to convert nitrogen to ammonium sulfate. An excess of sodium hydroxide is added to the digest to liberate ammonia. The sample is steam distilled and the liberated ammonia is collected in a boric acid solution and titrated with hydrochloric acid, using a colorimetric end-point detection. The measured nitrogen content is calculated from the amount of determined ammonia.

EXPERIMENTAL

Apparatus

- KjelROC Digestor: DI-210-A, DI-220-A, DI-310-A or DI-320-A
- Exhaust system, compatible with the Digestor
- KjelROC Analyzer KD-310-A (steam distillation/auto titration) or KjelROC Distillation Unit KD-210-A (steam distillation/manual titration)
- KjelROC Scrubber DI-110-A or KjelROC Digestor-water jet pump DI-054-A
- Analytical balance
- Digestion tubes – 250 ml

Reagents and accessories

- Sulfuric acid, concentrated (95-98%)
- Kjeldahl tablets, Missouri Tablet, Cu 0,3%, 3,5 g: KT-211-A
- Sodium Hydroxide, 40% (w/w)
- Hydrocloric acid, 0,2000 N
- Boric acid, 1% (w/v). See LA1000 for preparation

Samples

Liquid milk, sour milk and yoghurt with a declared protein content of 3,4 g/100 g. Purchased at a local supermarket.

Weigh 10 g of sample into a test tube

Digestion

Add 2 Kjeldahl tablets and 12 ml H_2SO_4. Place tubes in digestion block (420°C) and position the exhaust and turn on the Scrubber or water jet pump. Digest for 60 minutes. Remove rack with exhaust and let cool.

Note: Digestion time can be optimized using a high protein, high fat milk sample.

Distillation

On some systems part or all of this is performed automatically.

Dilute cooled digest with 70 ml H_2O and add 50 ml NaOH (40%). Add 30 ml boric acid to receiver vessel. Distil and titrate with HCl (0,2000 N). Perform a blank before each batch of samples.

CALCULATIONS

$$\%Nitrogen = \frac{(T - B) \times N \times 14{,}007 \times 100}{weight_{sample}(mg)}$$

T = Sample titration

B = Blank titration

N = Normality of titrant

$$\%\mathrm{Pr}otein = N \times F$$

F = protein factor = 6.38 for milk

REFERENCES

This Application Note should be used in conjunction with Application Note LA1000 “Application Guide”

OG 1000 KjelROC Analyzer Operation Manual

OG 1010 KjelROC Distillation Unit Operation Manual

KjelROC Application Note

OG 1004 KjelROC Digestor Operation Manual

OG 1006 KjelROC Scrubber Operation Manual