



## Method 7.4 – Raw sugar: moisture by oven drying

### 1. Rationale

This method is applicable to raw sugar with a moisture content of less than 0.5%. The method determines the moisture gravimetrically by oven drying.

### 2. Principle

The moisture in sugar is present in three forms:

- free moisture contained on the surface of the crystal leaving the centrifugals which is easily and quickly removed by drying,
- bound moisture contained in the glassy layer on the surface and in the re-entrant angles and which is released slowly as the glass crystallizes, and
- inherent moisture included within the crystal structure and released only, in general, by grinding.

The method uses oven drying at atmospheric pressure ( $105 \pm 1^\circ\text{C}$ ) followed by standardised cooling conditions and therefore mainly estimates the amount of free moisture associated with the sample.

### 3. Apparatus

- 3.1 Balance** readable to 0.0001 g
- 3.2 Moisture dish:** stainless steel with cover, 80 mm  $\phi$ , 10-20 mm depth
- 3.3 Desiccator** containing self-indicating silica gel
- 3.4 Oven operating** at atmospheric pressure and maintained at  $105 \pm 1^\circ\text{C}$

### 4. Procedure

Heat the dish and cover for approximately 30 minutes in the oven ( $105 \pm 1^\circ\text{C}$ ). Remove the dish and cover from the oven and allow to cool in a desiccator for approximately 1 hour before weighing accurately to 0.0001 g. Add approximately 10 g of sample to the dish immediately replacing the cover and weigh the dish and contents again accurately to 0.0001 g. Place the cover underneath the dish, transfer to the oven at  $105 \pm 1^\circ\text{C}$  and dry for 3 hours  $\pm$  5 minutes. Replace the cover and transfer the dish to a desiccator for cooling to room temperature before re-weighing. The analysis should be done in duplicate.

### 5. Calculations

Express the loss of mass due to drying as a percentage of the original mass of the sample. Average the duplicate results and report to two decimal places.

$$\text{Moisture \% sugar} = \frac{(M_2 - M_3)}{(M_2 - M_1)} \times 100$$

where  $M_1$    ≡    mass of dish and cover (g)  
 $M_2$    ≡    mass of dish, cover and sugar before drying (g)  
 $M_3$    ≡    mass of dish, cover and sugar after drying (g)

## 6. Example

Mass of dish and lid	=	66.8497 g
Mass of sugar, dish and lid	=	76.3542 g
Mass of sugar before drying	=	9.5045 g
Mass of sugar, dish and lid after drying	=	76.3404 g
Moisture	=	0.0138 g
Moisture % sugar	=	$\frac{0.0138 \text{ g}}{9.5045 \text{ g}} \times 100$
	=	0.15%

Report as 0.15%

## 7. Precision

The tolerance associated with the analysis is  $\pm 0.02$  unit.

## 8. References

ICUMSA (1994). Sugar moisture by loss on drying. *ICUMSA Methods Book*, GS2/1/3-15.

Mellet P, Lionnet GRE, Kimmerling ZJ and Bennett PJ (1982). Standards for analytical precision of sugar and molasses analyses. *Proc S Afr Sug Technol Ass*, **56**: 55-57.

SASTA (1985). *Laboratory Manual for South African Sugar Factories*. 3<sup>rd</sup> Edition: 319.

SMRI (1997). Determination of the moisture in raw sugar by loss on drying. *SMRI Test Methods*, TM036.