Method 1.13 - Official Methods: clarifier mud pol

1. Rationale

This method is applicable to clarifier mud samples and is used to obtain data for cane payment purposes.

2. Principle

The well-mixed clarifier mud is reacted with lead sub-acetate powder for clarification and used to determine the pol of the solution. When calculating the final pol of the sample the Brix of the solution is always needed.

3. Apparatus

3.1   Saccaharimeter and 200 mm pol tube
3.2   Filter paper, Whatman No. 91 or equivalent (185 mm ϕ)
3.3   Beaker (200 cm^3)
3.4   Stemless funnel (100 mm ϕ)
3.5   Watch glass (100 mm ϕ)

4. Reagents

4.1   Lead sub-acetate powder

Lead sub-acetate trihydrate [Pb(OAc)$_2$· 3H$_2$O], also called basic lead acetate, is poisonous and will accumulate in the human body. Direct contact through the skin, inhalation (powder dust) or swallowing must be avoided. Wear a dust mask, gloves and safety glasses during use.

5. Procedure

To the remaining portion of the mud sample prepared in Method 1.12, add sufficient lead sub-acetate powder for clarification. (The amount added must be the minimum required for clarification as over-leading will introduce errors. The amount of lead sub-acetate required for clarifier mud will depend on the load of particular matter prevailing at the time and will have to be determined beforehand by trial and error).

Vigorously shake the contents of the bottle to disperse the lead sub-acetate powder and then allow to stand for about 30 seconds to permit flocculation of the precipitate.

Place a fluted filter paper in the stemless funnel which has been placed in the mouth of the beaker so that it is supported by the rim of the beaker.

Pour the leaded sample, in one operation, into the funnel, taking care not to overflow the upper edge of the filter paper. Cover with the watch glass.

Discard the first 25 cm^3 of filtrate.

Swirl the filtrate in the beaker and then rinse the Pol tube three times with a portion of the filtrate.

Fill the tube with the remaining filtrate and read the polarisation.

The saccharimeter/polarimeter reading must be taken at $20.0 \pm 0.1°C$.

6. Calculations

The pol is calculated using the Schmit formula:

$$pol = \frac{\text{polarimeter reading}}{\left(0.0000576 \times \text{Brix}^2 + 0.014752 \times \text{Brix} + 3.83545\right)}$$

7. Precision

The tolerance associated with the pol analysis is $\pm 0.05°Z$.

8. Example

Saccharimeter reading	=	20.00°Z
Brix of diluted sample (Method 1.14)	=	6.00°Bx

From Schmitz formula the Pol is then calculated using the saccharimeter reading of 20.00°Z and Brix of 6.00°Bx and is found to be 5.10°Z.

From the above pol % clarifier mud is calculated as follows:

Pol % clarifier mud   =   Pol % diluted sample $\times$ 0.01 (200 - insoluble solids % mud)
                        = 5.10×0.01 (200 - insoluble solids % mud)

Note: see calculation of insoluble solids % mud which is applicable in circumstances where there is total and continuous re-routing of clarifier muds. For partial/intermittent re-routing, clarifier muds must be analysed for insoluble solids as described in Method 1.15.

9. References

Brokensha, MA, (2000). *Official Methods for the massing, sampling, analysis and calculation for clarifier mud returned to diffuser/milling tandems.* SASA Council, ADM620/MAB/cp.