



## Test Method for Determination of Methylene Blue Value (MBV) of Mineral Aggregate Fines

### 1. Scope

- 1.1 This test method is used to identify the presence of clays of the smectite group, organic matter or iron hydroxides in an aggregate, indicating its reactivity.

### 2. Referenced Documents

- Afnor Tentitive Standard P18-592, July, 1980. "Aggregates–Methylene Blue Test" Afnor Tour Europe, Cedex 7, 92080 Paris La Defense (copyrighted).
- Alan Woodside, personal communication to Benedict, University of Ulster, at Jordanstown, Northern Ireland, 5/85.
- Micheal Breunan, personal communicaton to Coyne 1/89, School Engineering, University College, Galway, Ireland.
- M. Doyle "Methylene Blue Test on Fine Aggregates" Sahuaro Pet. In-house test method, Phoenix, Arizona.
- T. Szymoniak and T. S. Vinson "Determining Clay Minerals in Basalt aggregates," TRB 1989, Session 123(#880019).

### 3. Significance

- 3.1 This method can indicate the impact of aggregate fines on slurry system performance.

### 4. Summary of Method

- 4.1 Methylene blue solution is titrated into distilled water containing aggregate fines passing the 75  $\mu\text{m}$  (No. 200) sieve. A drop of aggregate fines/methylene blue solution is removed via a glass rod and placed on to filter paper. When the aggregate fines can no longer absorb more solution, a blue ring is formed on the paper.

### 5. Apparatus and Reagents

- 5.1 Burette of at least 50-ml capacity with 0.1-ml graduations.
- 5.2 Burette stand.
- 5.3 250 ml glass beaker.
- 5.4 Magnetic mixer with suitable stir bar.
- 5.5 Suitable capacity scale or balance sensitive to within 0.01 gram.
- 5.6 Round tipped glass rod of 6-8 mm diameter x 150- 250 mm in length.
- 5.7 Suitable timer to read seconds.
- 5.8 75  $\mu\text{m}$  (No. 200) and 45  $\mu\text{m}$  (No. 325) sieves and pan.
- 5.9 1000 ml volumetric flask.
- 5.10 Methylene blue, reagent grade.
- 5.11 Distilled or deionized water.
- 5.12 Whatman No. 40 filter paper or equivalent.

### 6. Procedure

- 6.1 Weigh  $1 \pm 0.01$  g of methylene blue into the volumetric flask and dilute to 1000 ml with distilled/deionized water.
- 6.2 Fill the burette with methylene blue solution.
- 6.3 A representative sample of the fine aggregate is dried to constant weight and screened through the 75  $\mu\text{m}$  (No. 200) sieve. The 45  $\mu\text{m}$  (No. 325) or other sieve may be used. The portion of the aggregate passing the desired sieve is retained for testing while the remainder is discarded.
- 6.4 Weigh  $1 \pm 0.05$  g of the prepared aggregate fines into the 250 ml glass beaker and add  $30 \pm 0.1$  grams of distilled/deionized water. Add the stir bar, place the beaker on the magnetic mixer and stir for 5 minutes. The mixing speed should not be so vigorous that liquid splashes on the walls of the beaker or the solution is totally displaced immediately above the stir bar.
- 6.5 Titrate 0.5 ml of the methylene blue solution into the continually stirred fine aggregate suspension.
- 6.6 Stirring is continued for 1 minute.

- 6.7 With the glass rod, remove a drop of the aggregate suspension and transfer it onto a clean section of the filter paper.
- 6.8 Initially, the drop forms a well defined circle of methylene blue-stained fines surrounded by an outer ring of water. Observe the outer ring for coloration. If it is clear, repeat steps 6.5 – 6.7. When a light blue coloration or “halo” is observed, continue stirring for five minutes.
- 6.9 Repeat step 6.7 to confirm the presence of the blue outer ring. If confirmed, record the total ml of methylene blue solution used.
- 6.10 If the presence of a blue outer ring is not confirmed, repeat steps 6.5 – 6.9.

## 7. Report

The methylene blue value (MBV) is equivalent to the ml of methylene blue solution used and is reported as milligrams of methylene blue per gram of specific mineral aggregate fines fraction.

Examples include:

MBV = 5.5 mg/g, 0/No. 200 (75  $\mu$ m)

MBV = 4.0 mg/g, 0/No. 325 (45  $\mu$ m)

MBV = 2.3 mg/g, 0/No. 8 (2.36 mm)

## NOTES:

Literature indicates variations of the method. Methylene blue solution concentrations are reported as 1 mg/ml, 4.5 mg/ml, 10 mg/ml and 1 mol to .08 mol solutions. Aggregate sample sizes are reported as 1 gram, 20 grams, 30 grams, 200 grams and 1000 grams. Specimen gradations are 0/No. 325 (45  $\mu$ m), 0/No. 200 (75  $\mu$ m), 0/No. 10 (2.0 mm), 0/No. 8 (2.36 mm), 0/No. 4 (4.75 mm), and clean 3/8 in (9.5 mm) one-size chips. For simplification and standardization, we suggest reporting the MBV as mg of methylene blue/g of specific aggregate fraction.