

**TITANIUM DIOXIDE CONTENT IN THERMOPLASTIC AND SPRAYED THERMOPLASTIC PAVEMENT
MARKING MATERIAL**
(Kansas Test Method KTMR-40)

1. SCOPE

1.1 This method determines the amount of titanium dioxide in the white solidified molten thermoplastic pavement marking material as received from the Paint and Miscellaneous subsection.

2. REFERENCED DOCUMENTS

2.1. AASHTO M 231: Weighing Devices Used in the Testing of Materials

3. APPARATUS

3.1. Balance capable of meeting AASHTO M 231, Class A

3.2. Stir plate and stir bar

3.3. Fusion instrument

3.4. Casting dish and platinum fusing crucible

3.5. ICP emission spectrometer

3.6. 15-mL plastic beakers

3.7. 200-mL volumetric flask

3.8. 300-mm filter funnel

3.9. Guth wash bottle

3.10. Whatman filter paper, 30-mm, Grade 41

3.11. Deionized water

3.12. Lithium metaborate, 99%

3.13. Concentrated hydrochloric acid, Certified ACS Plus

3.14. Concentrated nitric acid, Certified ACS Plus

3.15. 1% hydrochloric acid solution

3.16. 100 ppm titanium standard solution

3.17. Safety glasses/goggles

3.18. Acid resistant gloves.

4. PROCEDURE

(NOTE: It is essential that proper safety eyewear and gloves are worn during this procedure.)

- 4.1. Weigh 2.5g (+/-0.25) of the lithium metaborate and approximately 0.25g of thermoplastic material using an analytical balance. Record the exact quantity of thermoplastic weighed.
- 4.2. Transfer the lithium metaborate and thermoplastic material into a platinum fusion crucible.
- 4.3. Place the crucible into the fusion instrument, and place a casting dish on top of the crucible. At 80% power, fuse the content of the crucible for approximately 5 minutes. Working quickly, uncover the crucible, remove the crucible from the fuser, swirl the content a few times and then pour the melt into a 150-mL plastic beaker containing approximately 90 mL of deionized water and 10 mL of concentrated hydrochloric acid. (Placing the solution beaker inside of another empty 150-mL plastic beaker may be necessary in case the solution beaker melts.)
- 4.4. Place a magnetic stir bar into the beaker and set the beaker on a stir plate and allow the solution to stir at a moderate rate until it appears the melt is completely dissolved.
- 4.5. Filter the solution through a Whatman 41 filter paper in a 30-mm long-stemmed filter funnel capturing the filtrate in a 200-mL volumetric flask. Rinse the filter paper with the 1% HCl wash solution until the flask is almost full.
- 4.6. Allow the solution to cool to room temperature. Add approximately ½ ml of concentrated nitric acid and fill to the 200-mL mark with deionized water. Stopper the flask and mix the contents thoroughly.
- 4.7. Turn on the ICP spectrometer and allow it to reach operating condition. Using method ThermPlasticTiO₂, calibrate the spectrometer using the 100 ppm titanium standard solution.
- 4.8. Run the sample solution on the spectrometer and record the concentration of titanium.
- 4.9. Calculate and report the results as % titanium dioxide using the following:

$$\% \text{ Titanium Dioxide} = \frac{C \times V \times 1.67 \times 10^{-6} \times (100 - Y)}{M}$$

Where:

C = concentration of titanium standard solution (100 ppm)

V = sample solution volume (200 mL)

Y = concentration of binder content, %

M = mass of sample used, g