



FKIT MCM XIX



Određivanje ostatka pri prosijavanju homogenizirane otpadne emulzije

Determination of residue on sieving of homogenous waste emulsion

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INTRODUCTION

There are several methods by which emulsions can be characterized. Differential scanning calometry can be used to determine the water content of a particular emulsion. The thermal stability of the emulsion can be determined by thermogravimetric analysis. The viscosity of the emulsion can be determined by rheological measurements. Optical microscopy monitors the particle size and homogeneity of the emulsion. However, the two most important methods of emulsion analysis are the adhesion of the emulsion to the substrate or stone and the sieve test. Sieving is a very simple method that allows determining the homogeneity of emulsions. In this work, the sieve residue of the homogenized waste emulsion is analyzed. The known mass of the homogenized waste emulsion is filtered through a sieve with a mesh size of 0.5 mm and 0.16 mm. The weight percentage of the residual particles is important to avoid clogging of the equipment used to spray the emulsion when paving the asphalt layer. The amount of binder retained on the sieves is weighed after washing and drying.

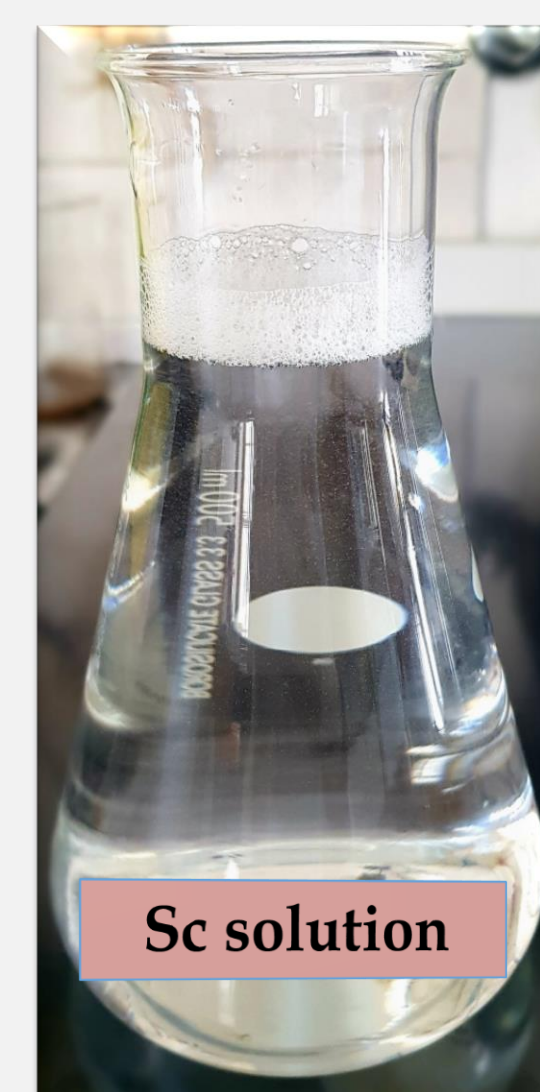
RESULTS

Test method

Wash the sieve with rinsing agent (toluene) and then with ethanol. Place the sieve on a sieve pan and dry it in the oven ($100 \pm 5^\circ\text{C}$) for at least one hour. After drying, cool the sieve and the sieve pan in a desiccator for 30 minutes. Weigh the sieve and the sieve pan together. Soak the sieve cloth with the solution Sc*. Drain the sieve thoroughly and place it on a funnel which is mounted over a glass container. Weigh the container (m_C) - it is only weighed for sieving on a 0.500 mm sieve. Weigh 200 g of the emulsion into the container ($m_{E,0.500}$). Pour the emulsion through the wetted sieve and let it drain completely. Weigh the container with the residual emulsion and record it as $m_{C,R}$ (weighs only for the 0.500 mm sieve). Wash the residue on the sieve with the Sc* solution and then with water until the washings run clear. Drain the sieve thoroughly, place it on a sieve pan and dry it in the oven ($100 \pm 5^\circ\text{C}$) for 2 hours. Then cool it in a desiccator for 30 minutes. Weigh the sieve with its sieve pan and residue (m_2 for a 0.500 mm sieve or m_4 for a 0.160 mm sieve).

For the test to be carried out according to the standard, a cationic solution Sc* had to be prepared. The cationic solution consisted of water, cetyltrimethylammonium bromide and hydrochloric acid.

The only difference in the procedure for determining the particles of the emulsion with a 0.160 mm sieve compared to a 0.500 mm sieve is that 50 g of emulsion, which has already passed through a 0.500 mm sieve, is mixed with 50 mL of Sc* solution before the emulsion is poured onto a 0.160 mm sieve.



Visual assessment of emulsion particle residues after sieving



Calculation

$$R_{0.500} = \frac{(m_2 - m_1)}{m_{E,0.500} - (m_{C,R} - m_C)} * 100$$
$$R_{0.500} = \frac{(182.93 - 179.55)}{200.22 - (185.07 - 172.60)} * 100$$
$$R_{0.500} = 1.80 \%$$

$$R_{0.160} = \frac{(m_4 - m_3)}{m_{E,0.160}} * 100$$
$$R_{0.160} = \frac{(172.40 - 171.23)}{49.95} * 100$$
$$R_{0.160} = 2.34 \%$$

LEGEND

m_1 - mass of washed and dried sieve (0.500 mm) along with the sieve pan
 m_C - glass container mass
 $m_{E,0.500}$ - emulsion mass
 $m_{E,0.160}$ - emulsion mass
 $m_{C,R}$ - mass of the container with leftover emulsion
 m_2 - mass washed and dried sieve (0.500 mm) and the sieve pan with the residue
 m_3 - mass of washed and dried sieve (0.160 mm) with its pan
 m_4 - mass of washed and dried sieve (0.160 mm) and the sieve pan with the residue

Some residue of emulsion particles is immediately visible on a 0.500 mm sieve. To prove the above conclusion, the actual residue of emulsion particles on both sieves had to be calculated.

CONCLUSION

The sieve test is one of the two most important methods of emulsion analysis in the industry involved in the construction and asphaltting of roads, along with the adhesion of the emulsion to the substrate. Before the asphalt layer is applied, the substrate (stone aggregate) must be sprayed with an emulsion to bond the two layers. It is therefore important to avoid clogging of the equipment used to spray the emulsion when paving the asphalt layer. A sieve test can also be used to easily determine the homogeneity of the emulsions. The mass of the homogenised waste emulsion filtered through a sieve with a mesh size of 0.500 mm was 200 g, while the mass filtered through a sieve with a mesh size of 0.160 mm was 50 g. The weight percentage of the remaining particles of the homogenised waste emulsion passing through a sieve with a mesh size of 0.500 mm was 1.80% and through a sieve with a mesh size of 0.160 mm was 2.34%. There was no significant increase in the residual mass of the waste emulsion particles when the mesh size of the sieve was significantly reduced (by about three times).

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