

SIZE DISTRIBUTION OF SOLID PHOSPHORIC ACID CATALYST

UOP Method 854-85

SCOPE

This method is for determining the size distribution of solid phosphoric acid catalyst by screening through standard testing sieves. The method is applicable to SPA-1 and SPA-2 catalysts.

OUTLINE OF METHOD

A representative 500 g sample is placed on the top of a nest of appropriate mesh size sieves with a bottom pan. The nest is covered, placed in a sieve shaker and shaken for two minutes. The material retained on each sieve and in the bottom pan is weighed to the nearest 0.1 g. The mass percent of material retained on each sieve and in the bottom pan is calculated.

APPARATUS

Balance, readability, 0.1-g, capacity 4 kg, Mettler PC4400, Sargent-Welch Scientific, Cat. No. S-2556-28, or equivalent

Brush, 50-mm (2-inch) wide paint brush with bristles cut to 25-mm (one-inch), or equivalent

Gloves, rubber, Playtex, Sargent-Welch Scientific, Cat. No. S-40268, or equivalent

Mask, Nuisance Level Acid Gas Respirator, Lab Safety Supply, Cat. No. R4790, or equivalent

Riffler, Jones rifle splitter, 19-mm (0.75-inch) chute width, Sepor, Cat. No. 040G-021, or equivalent

Sieve shaker, Tyler Ro-Tap with sound enclosure, W. S. Tyler, or equivalent

Sieves, 203-mm (8-inch) diameter, brass, full height, (ASTM E 11 Specification), Tyler Nos. 3, 3-1/2, 4 and 8 mesh (sieve opening 6.7, 5.6, 4.75 and 2.36 mm, respectively), including cover and 2 bottom pans with extended rim, W. S. Tyler, or equivalent

IT IS THE USER'S RESPONSIBILITY TO ESTABLISH APPROPRIATE PRECAUTIONARY PRACTICES AND TO DETERMINE THE APPLICABILITY OF REGULATORY LIMITATIONS PRIOR TO USE. EFFECTIVE HEALTH AND SAFETY PRACTICES ARE TO BE FOLLOWED WHEN UTILIZING THIS PROCEDURE. FAILURE TO UTILIZE THIS PROCEDURE IN THE MANNER PRESCRIBED HEREIN CAN BE HAZARDOUS. MATERIAL SAFETY DATA SHEETS (MSDS) OR EXPERIMENTAL MATERIAL SAFETY DATA SHEETS (EMSDS) FOR ALL OF THE MATERIALS USED IN THIS PROCEDURE SHOULD BE REVIEWED FOR SELECTION OF THE APPROPRIATE PERSONAL PROTECTION EQUIPMENT (PPE).

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PROCEDURE

Riffle the sample to obtain a representative 500 g fraction for analysis. *CAUTION: Since SPA catalyst, or catalyst dust, may irritate the skin and nasal passages, gloves and a dust mask must be worn when handling this material.* Nest the appropriate sieves in ascending numerical order on the bottom pan. For SPA-1 use sieves 3-1/2 and 8. For SPA-2 use sieves 3, 3-1/2, 4 and 8. Place the sample to be tested on the top sieve, cover and place in the shaker. Shake for 2 ± 0.05 minutes and then remove the sieves from the shaker. Carefully transfer the material retained on the top sieve into a spare tared bottom pan by inverting the sieve over the pan. Brush the underside of the sieve to remove material lodged in the mesh. Weigh the pan and collected material to the nearest 0.1 g, subtract the mass of the empty pan and record the difference as the mass of material retained on that sieve. Repeat this procedure for each sieve and then obtain the mass of the material in the bottom pan.

CALCULATIONS

Calculate the mass-percent retained on each sieve and bottom pan as follows:

$$\text{Amount on Sieve, mass-\%} = \frac{100 A}{B}$$

where:

A = material on sieve or in pan, g

B = total material recovered from all sieves and bottom pan, g

100 = factor to convert to mass-%

REPORTING RESULTS

Report results as follows:

Particle Size Distribution of SPA-1, mass-%

Retained on sieve No. 3-1/2
Through No. 3-1/2, on No. 8
Through No. 8

Particle Size Distribution of SPA-2, mass-%

Retained on sieve No. 3
Through No. 3, on No. 3-1/2
Through No. 3-1/2, on No. 4
Through No. 4, on No. 8
Through No. 8

PRECISION

Based on the pairs of analyses shown below, the estimated standard deviation (esd) for SPA catalyst was calculated and is listed in the following table. Duplicate results by the same operator should not differ by more than the allowable difference shown (95% probability).

SPA 1

<u>Size Distribution</u>	<u>Number of Pairs</u>	<u>mass-%</u>	<u>esd, mass-%</u>	<u>Allowable Difference, mass-%</u>
Retained on Sieve No. 3-1/2	5	93.0	0.48	1.8
Through No. 3-1/2, on No. 8	5	6.5	0.48	1.8
Through No. 8	5	0.5	0.05	0.2

SPA 2

<u>Size Distribution</u>	<u>Number of Pairs</u>	<u>mass-%</u>	<u>esd, mass-%</u>	<u>Allowable Difference, mass-%</u>
Retained on Sieve No. 3	7	2.5	0.92	3.1
Through No. 3, on No. 3-1/2	7	35.0	3.1	10.5
Through No. 3-1/2, on No. 4	7	57.0	2.9	9.8
Through No. 4, on No. 8	7	5.0	1.1	3.8
Through No. 8	7	0.5	0.18	0.63

TIME FOR ANALYSIS

The elapsed time for one analysis of SPA 1 catalyst is 0.5 hour, and for SPA 2, 0.6 hour.

The labor requirement for one analysis of SPA 1 is 0.3 hour, and for SPA 2, 0.4 hour.

SUGGESTED SUPPLIERS

Lab Safety Supply, P.O. Box 1368, Jonesville, WI 53547

Sargent-Welch Scientific, 7300 N. Linder Ave., Skokie, IL 60077

Sepor, Inc., P.O. Box 578, Wilmington, CA 90748

W. S. Tyler, Inc., 8200 Tyler Blvd., Mentor, OH 44060