



APPENDIX D

PARTICLE SIZE – U.S. SIEVE SIZE AND TYLER SCREEN MESH EQUIVALENTS

In the multiphase combustion area, we often encounter unburned and partially burned particles of different sizes. In the United States, these sizes are often expressed in a standard measured quantity in terms of either U.S. Sieve Size or Tyler Screen Mesh. Sieving or screening is a method of separating a mixture of particles (or grains) into two or more size fractions (see Tables E.1 and E.2). The over size particles are trapped above the screen while undersize particles can pass through the screen. Sieves can be used in stacks, to divide samples up into various size fractions and hence determine particle size distributions. Sieves and screen usually are used for larger particle sizes, $d_p \geq 37 \mu\text{m}$ (0.037mm).

TABLE D.1. Standard U.S. Sieve Sizes and Tyler Mesh Sizes

U.S. Sieve Size	Tyler Mesh Size	Opening (mm)	Opening (in)
—	2½ mesh	8.00	0.312
—	3 mesh	6.73	0.265
No. 3½	3½ mesh	5.66	0.233
No. 4	4 mesh	4.76	0.187
No. 5	5 mesh	4.00	0.157
No. 6	6 mesh	3.36	0.132
No. 7	7 mesh	2.83	0.111
No. 8	8 mesh	2.38	0.0937
No. 10	9 mesh	2.00	0.0787
No. 12	10 mesh	1.68	0.0661
No. 14	12 mesh	1.41	0.0555
No. 16	14 mesh	1.19	0.0469
No. 18	16 mesh	1.00	0.0394
No. 20	20 mesh	0.841	0.0331
No. 25	24 mesh	0.707	0.0278
No. 30	28 mesh	0.595	0.0234
No. 35	32 mesh	0.500	0.0197
No. 40	35 mesh	0.420	0.0165
No. 45	42 mesh	0.354	0.0139
No. 50	48 mesh	0.297	0.0117
No. 60	60 mesh	0.250	0.0098
No. 70	65 mesh	0.210	0.0083
No. 80	80 mesh	0.177	0.0070
No. 100	100 mesh	0.149	0.0059
No. 120	115 mesh	0.125	0.0049
No. 140	150 mesh	0.105	0.0041
No. 170	170 mesh	0.088	0.0035
No. 200	200 mesh	0.074	0.0029
No. 230	250 mesh	0.063	0.0025
No. 270	270 mesh	0.053	0.0021
No. 325	325 mesh	0.044	0.0017
No. 400	400 mesh	0.037	0.0015

TABLE D.2. Particle Characteristics for Different Sizes

	0.0001	0.001	0.01	0.1	1	10	100	1,000	10,000	100,000	1,000,000	10,000,000	100,000,000	1,000,000,000
	Particle Diameter, microns (μ)													
	0.0001	0.001	0.01	0.1	1	10	100	1,000	10,000	100,000	1,000,000	10,000,000	100,000,000	1,000,000,000
	Particle Diameter, microns (μ)													
Equivalent Sizes														
Electromagnetic Waves	X-Rays Visible Solar Radiation Near Infrared Far Infrared Microwaves (Radar, etc.)													
Typical Particles and Gas Dispersoids	O ₂ , CO ₂ , H ₂ , F ₂ , C ₂ H ₄ , CH ₄ , N ₂ , SO ₂ , CO, H ₂ O, HCl, C ₂ H ₁₀ Gas Molecules #Molecular diameters calculated from viscosity data at 0°C. Rosen's Smoke Oil Smokes Tobacco Smoke Mechanical Dusts and Slurries Ammonium Chloride Fly Ash Coal Dust Cement Dust Sulfuric Acid Concentrated Mist Carbon Black Sulfuric Mist Fat Sprays Insecticide Dusts Ground Talc Spray Dried Milk Spores Plant Pollens Alkali Fume Milled Flour Nebulizer Droplets Fog Rain Nozzle Droplets Red Blood Cell Diameter (Average): 7.5 μ ± 0.5 μ Bacteria Human Hair Hyaline Nozzle Droplets Fertilizer, Ground Limestone Beach Sand Polverized Coal Flotation Ores													
Methods for Particle Size Analysis	Impingers Sieves Electroformed Ultramicroscope Electron Microscope Centrifuge Elutriation Ultracentrifuge Sedimentation Turbidity ⁺ Permeability ⁺ Adsorption ⁺ Light Scattering ⁺⁺ Nuclear Counter Electrical Conductivity Scanners Machine Tools (Micrometers, Calipers, etc.) Sieving *Finishes average particle distribution **Size distribution may be obtained by special calibration.													
Particle Diffusion Coefficient, cm²/sec.	In Air at 25°C: 1 atm. In Water at 25°C:													
<small>* Stokes-Cunningham correction factors are given but not included for water</small>														

¹Reference: Modified from the CRC Handbook of Chemistry and Physics, 83rd Edition 2002-2003, pp. 15-31