

B. MINIMUM EXPLOSIVE CONCENTRATIONS

There is probably greater variation in the values reported by different investigators of minimum explosive concentrations of dust clouds than for any other explosibility factor, because the uniformity of the dust cloud, which varies

TABLE 5
Minimum Explosive Concentrations of Metal Powders

Powder	Minimum concentration (mg./liter)	Powder	Minimum concentration (mg./liter)
Aluminum, atomized	40	Thorium	75
Aluminum, stamped	35	Thorium hydride	80
Antimony	420	Titanium	45
Dowmetal	20	Titanium hydride	70
Iron, carbonyl	105	Uranium	60
Iron, hydrogen reduced	120	Uranium hydride	60
Iron, carbon reduced	250	Vanadium	220
Magnesium, atomized	10	Zinc	480
Magnesium, milled	20	Zirconium	40
Magnesium, stamped	20	Zirconium hydride	85
Manganese	125	Ferrosilicon (88% Si)	425
Silicon	100	Ferrotitanium, low-carbon	140
Tin	190	Magnesium-aluminum (50-50)	50

TABLE 6
Minimum Explosive Concentrations of Dusts in Plastics Industry

Powder	Minimum concentration (mg./liter)	Powder	Minimum concentration (mg./liter)
Resins		Molding compositions	
Allyl alcohol	35	Cellulose acetate	35
Cellulose acetate	25	Cellulose acetate butyrate	25
Cellulose propionate	25	Ethyl cellulose	25
Coumarone-indene	15	Methyl methacrylate	20
Lignin	40	Phenolic	30
Phenolic	25	Polystyrene	15
Pine-rosin base	55	Rubber, synthetic	30
Polyethylene	20	Urea	75
Polystyrene	15		
Polyvinyl acetate	35		
Shellac-rosin-gum	15		
Urea	70		
Vinylbutyral	20		
Resin ingredients		Fillers for molding compositions	
Hexamethylenetetramine	15	Ground alpha pulp	60
Pentaerythritol	30	Ground cotton flock	50
Phthalic anhydride	15	Ground wood flour	40
Rennet casein	45		
Resin stabilizer	180		

according to the experimental procedure, is very important in the determination, and because different interpretations were placed on what constitutes a feeble explosion, such as is obtained at these low concentrations. For aluminum powder the published values¹⁶ range from 7 to 432 mg. per liter and for sugar dust they range from 10.3 to 370 mg. per liter.⁹ A dust concentration of 1 mg. per liter is approximately equal to 1 oz. per 1,000 cubic feet.

Tables 5, 6, and 7 list selected values of minimum explosive concentrations of metal, plastic, agricultural, and miscellaneous dusts and powders determined in

TABLE 7
Minimum Explosive Concentrations of Agricultural and Other Dusts

Agricultural products	Minimum concentration (mg./liter)	Miscellaneous dusts	Minimum concentration (mg./liter)
Alfalfa	100	Aluminum stearate	15
Almond flour	150	Bark dust, Douglas fir	30
Cellucotton	50	Coal, bituminous*	50
Citrus peel, dehydrated	60	Coal-tar pitch	35
Clover seed	60	Cork	35
Cornstarch, ordinary	40	Dinitro-orthocresol	25
Cornstarch, modified	45	Gilsonite	20
Corncob, ground, dried	30	Liver protein	45
Garlic, dehydrated	100	Napalm	20
Guar seed	40	Phenothiazine	15
Onion, dehydrated	130	p-Oxybenzaldehyde	20
Pea, dehydrated	50	Rubber, hard crude	25
Peanut cracklings	85	Soap	45
Rice	45	Sulfur	35
Soybean	35	Thyroid, desiccated	60
Sugar	35		
Tung kernels	70		
Wheat, cracked	60		
Wheat flour	50		

* See Figure 1.

the Bureau of Mines studies previously mentioned (see Figure 1 for data for coal in air and in oxygen). In general, these values are determined by dispersing varying quantities of dust samples in a cylindrical test vessel in which a high-voltage electric spark is formed across an approximately 1/4-inch gap. The top of the vessel is closed by a filter-paper diaphragm, which ruptures upon ignition and explosion of a sufficiently dense dust cloud (see Figure 6). Recently the lower explosive limits of several dusts have been determined also in a continuous dust-air stream. For the most part, the results check the earlier data rather satisfactorily, but further refinements in the test procedure are being made.

To date very little experimental work has been done on determination of the optimum concentrations and of the upper explosive limits of dust clouds. The

* R. B. Mason and C. S. Taylor, *Ind. Eng. Chem.*, 29, 626 (1937).