Introduction to Activated Carbon and Impregnated Carbon in Respiratory Mask Filter Canisters (Filter Elements)

1. New Standard: GB2890-2022 Respiratory Protection – Self-priming filter-type gas masks

Concept: A self-contained filtering gas mask is a type of clean-air protective equipment that relies on the wearer's spontaneous breathing to overcome the resistance of its components, thereby protecting the respiratory tract, eyes, and face from hazardous toxic gases, vapors, or particulate matter (e.g., toxic smoke, toxic mist).

Filter components: detoxification filter cartridge, detoxification filter canister; Masks: full-face mask, half-face mask

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Gas masks are classified into two types—pipe-type and direct-type—based on the connection method between the mask and the filter element.

2. Filter Element Type

Type A; protects against organic gases or phosgene with a boiling point exceeding 65 °C, such as benzene, carbon tetrachloride, nitrobenzene, and cyclohexane. External standard color: brown.

Type B; provides protection against inorganic gases or vapors, such as cyanogen chloride, hydrocyanic acid, chlorine, etc. External color code: gray.

Type E; provides protection against sulfur dioxide and other acidic gases or vapors. External color: yellow.

Type K; for protection against ammonia and organic ammonia derivatives. External reference color: green.

Type CO; protects against carbon monoxide gas. External color: white

Hg type; protects against mercury vapor. External color: red

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H2S type; protects against hydrogen sulfide. External color code: blue

3. Materials used for loading various types of filter elements (carbon and catalyst)

Type A: Activated carbon (09-particle carbon, 15-particle carbon, coconut shell 8×16,12×20)

Type B: Impregnation with Cu, Cr, Ag, and NH_3 (copper, chromium, silver, ammonia) — comprehensive protection

Type E: Impregnated with Na_2CO_3, Ag, and Cu (sodium carbonate, silver, copper); acidic gas

Type K: impregnated with $CuSO_4$ (copper sulfate); resistant to ammonia and ammonia-containing compounds

CO-type: Hargreaffite + desiccant (LiCl, lithium chloride; LiBr, lithium bromide); CO-proof

Hg-type: impregnated with KI (potassium iodide) to prevent mercury vapor

H2S type: impregnation with $CuSO_4$ (copper sulfate), with the impregnation dosage doubled compared to the K type. Resistant to hydrogen sulfide gases.

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Table 6: Standard Color Coding and Protection Durations of Filter Elements									
Filter element type	Color coding	Test medium	Level 3		Level 2		Level 1		Penetration concentration (mL/m³)
			Test medium concentration (mg/L)	guard timem in	Test medium concentration (mg/L)	guard timem in	Test medium concentration (mg/L)	guard timem in	
A	brown	cyclohexane	17.5	≥105	10.5	≥60	3.5	≥60	10
B	Gray	Hydrocyanic acid (chlorine cyan)	5.6 (3)	≥63 (≥50)	3.4 (1.1)	≥27 (≥23)	1.1 (0.6)	≥25 (≥22)	10
E	Huang	sulfur dioxide	13.3	≥30	8.0	≥23	2.7	≥25	5
K	Green	ammonia	3.6	≥55	2.1	≥25	0.76	≥25	25
CO	white	carbon monoxide	5.8	≥100	5.8	≥27	5.8	≥20	50
Hg	red	mercury	0.01	≥ 4800	0.01	≥ 3000	0.01	≥ 2000	0.1
H_2S	Lan	Hydrogen sulfide	7.1	≥110	4.2	≥35	1.4	≥35	10
C_2N_2 may be present in the gas stream; therefore, the total concentration of (C_2N_2 + HCN) shall not exceed 10 mL/m².									

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