Ambient Temperature Carbon Monoxide Oxidation Catalyst for Use in Respiratory Protective Devices

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In a fire, several toxic gases are generated which impede escape and cause permanent injuries and distress to the victims. The technologies for removing these gases are well founded. Most of the toxic gases concerned can be removed by adsorption, except carbon monoxide, which is scrubbed by catalytic oxidation to form carbon dioxide gas, which is harmless to human health. Carbon monoxide is odourless, colourless and tasteless which makes its detection by sensory organs impossible. It is a poisonous gas and reacts physiologically with disastrous consequences and is often fatal. In fact the major concern in a fire is the first few minutes before a flash over when the oxygen level is greater than 17% (enough to sustain breathing); under these circumstances the victims have no protection as the sensory organs are exposed and suffer from intoxification by acid gases, carbon monoxide, hydrocarbons etc.

Supported noble metal catalysts have been specially developed for use as low temperature carbon monoxide oxidation components in fire escape hoods/masks for mines, aircrafts, hotels and offices and in sealed environments, such as hyperbaric chambers and submarines. The catalysts show high and stable carbon monoxide oxidation capability, from (1%) 104ppm to 10ppm carbon monoxide at gas hourly space velocity of 37,000 h^{-1} with water saturated inlet gas temperature and below.

In this paper, we define laboratory test protocols and present data on catalyst performance for selected materials in the form of shaped pellets and monoliths. Ambient temperature operation and resistance to atmospheric water vapour have been demonstrated and as result they offer a viable alternative to copper/manganese oxides formulation. The catalyst is tolerant to water vapour and therefore does not require a drier or heated catalyst system. The catalyst is sufficiently porous to offer very little resistance to airflow.