

Decomposition and Removal of Effluent Freon-SF6 Mixture by RF Plasma

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The efficiency of recovery achieved by open or closed loop extraction of RPC exhaust gases is in the range of 90% to 95% under optimum conditions. For a large detector setup operating on one volume change per day basis, a 5% loss amounts to discharging 50 kg of R134a and 0.5 kg of SF6 into atmosphere every day. The emissions are equivalent to creating nearly 50,000 m³ of Carbon dioxide daily. Gas emissions need to be completely converted to safer compounds.

Gases such as R134a and SF6 are stable compounds. In order to decompose them, the mixture is first activated by adding of 50% oxygen and 2% Argon and under typical RF plasma conditions of 13.56 MHz., 1 torr pressure and 0.2 Watt/cm² power density. The chemical reaction takes place on the surface of a Silicon electrode. Product of the reaction is mainly SiF₄ (gas), which is further hydrolyzed to form HF solution and Silicon Hydroxide sludge. More than 90% of effluent gas mixture can be effectively removed by this method.

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