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## Fire Protection For Metal Alkyls

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Fire protection for trialkylaluminums has proved to be a difficult problem. And, because of their increased use in industry, it is becoming a more common problem. Most of these metal-organic compounds are pyrophoric liquids which ignite on contact with air.

Many aluminum alkyls are finding use as polymerization catalysts, reducing agents and chemical intermediates. They have been used in low-pressure polyethylene synthesis, tetraethyl lead production, alcohols synthesis and aluminum gas plating.

The handling and storage of these materials must be conducted under an inert atmosphere. Any leak or spill during the manufacturing process is followed immediately by a fire.

### New Extinguishing Agent

Ansul recently conducted a series of experiments for several companies which had fire protection problems with trialkylaluminums, using three different aluminum alkyl compounds as fuel. These were triethylaluminum, triisobutylaluminum and tri-n-propylaluminum. These experiments resulted in the development of MET-L-KYL dry chemical, a singularly effective extinguishing agent.

MET-L-KYL is dry chemical with a sodium bicarbonate base and an activated adsorbent. Its flow characteristics are such that it can be discharged effectively from Ansul dry chemical extinguishers. The application method is similar to that used in extinguishing a flammable liquid fire with ordinary dry chemical.

Initial application of MET-L-KYL dry chemical extinguishes the flame and continued application adsorbs the remaining fuel and prevents reignition. With this method, 10 pounds of triisobutylaluminum and 10 pounds of tri-n-propylaluminum, both in depth, were extinguished using 80 pounds of MET-L-KYL dry chemical applied from 350 pound capacity wheeled extinguishers. Ten pounds of triethylaluminum in a spill and in depth were extinguished using 100 pounds and 80 pounds of MET-L-KYL dry chemical applied from 30 pound capacity extinguishers. MET-L-KYL dry chemical caused a slight decomposition of the triethylaluminum during application, but this did not hinder extinguishment.

The ratio of pounds of MET-L-KYL dry chemical to pounds of any one of the three trialkylaluminums used ranged from 8:1 on fires in depth to 10:1 on spill fires. Quite a bit of the dry chemical was carried away by the fire's updraft during the initial flame extinguishing phase. This accounts for the large amount needed for complete extinguishment.

### Previous Methods

During the preliminary study of trialkylaluminum fires, various commercially available extinguishing agents were found unsatisfactory for control and complete extinguishment.

Water, whether straight stream or spray, and water-based extinguishing agents reacted readily and sometimes violently with burning trialkylaluminums. Although it was anticipated that water spray would react with the burning trialkylaluminum, it was thought the reaction might not be severe. But even water spray reacted violently with burning trialkylaluminum when in depth in the test pans.

Carbon tetrachloride had little or no effect toward either control or extinguishment. Carbon dioxide extinguished the flame on pan fires, but was ineffective on spill fires. Ordinary dry chemical and chlorobromonethane extinguished the flames on both types of fires, but, like carbon dioxide, did not adsorb remaining fuel and prevent reignition. Ansul's multi-purpose dry chemical, FORAY agent, suitable for use on Class A, B and C fires, extinguished the flame but could not adsorb remaining fuel and prevent reignition.

### Reignition Is Key Problem

Reignition is the big problem in all aluminum alkyl fires. Successful methods of extinguishment lie in the ability of agents not only to extinguish flame but to adsorb remaining fuel. The best method of disposal is to transfer the mixture to a dry metal container, applying additional agent if reignition occurs during transfer.

### **MET-L-KYL Extinguishers**

MET-L-KYL dry chemical can be provided only in very tight extinguishers such as Ansul cartridge-operated fire extinguishers and wheeled and stationary units equipped with HF type nozzles so there is maximum resistance to the entrance of moisture.

MET-L-KYL dry chemical should be used only in extinguishers which use nitrogen as the expellant gas. Specifically designed Ansul cartridge-operated extinguishers are fitted with nitrogen cartridges. If our standard carbon dioxide cartridge models are used, some of the carbon dioxide expellant gas is adsorbed by the activated adsorbent in the MET-L-KYL dry chemical which results in lower operating pressure, sluggish stream pattern and decreased extinguishing effectiveness.

Unless the fires in metal alkyls are known to be of only very small size, wheeled or stationary extinguishers with capacities of 150 pounds or more should be recommended to provide adequate protection.

### **Use of MET-L-KYL Dry Chemical**

Although MET-L-KYL dry chemical was developed mainly for use on flammable Class B liquids with low autoignition temperatures such as triethylaluminum, it can be used on any flammable liquids that are normally protected by ordinary bicarbonate dry chemicals.

"MET-L-KYL" DRY CHEMICAL SHOULD **NOT** BE USED ON FIRES IN COMBUSTIBLE METALS such as magnesium, sodium, potassium and sodium-potassium alloy (NaK). Its use would cause an already intense combustible metal fire to burn even more violently.

NOTE: The method of controlling and extinguishing metal alkyl fires as described in this bulletin is covered by U.S. Patent 2,969,116 which has been assigned to Ansul Incorporated.

Any suspected infringement of this patent should be reported immediately.