

# Waste Disposal

---

## Removal of Residues

The easiest way to remove any aluminum alkyl residues in pipes or tanks is to flush with an inert, dry hydrocarbon under nitrogen. According to the particular flushing problem, low viscosity petrols or heavy Diesel oils can be used. The resultant dilute aluminum alkyl solutions should have an aluminum alkyl content of less than 10%. These can be disposed of by burning or reacting with a long chain alcohol, preferably isopropanol.

## Solvolytic of Dilute Solutions

Disposal of dilute solutions (<10 %) of aluminum alkyls may also be accomplished by decomposing with water or alcohols, under controlled conditions in an inert gas atmosphere. This is best carried out by carefully adding only small quantities of the aluminum alkyl solution to an excess of water or alcohol, under efficient agitation.

The reactivity of solvolysing agents increases in the following order:

Butanol < n-propanol, isopropanol < ethanol, methanol < water

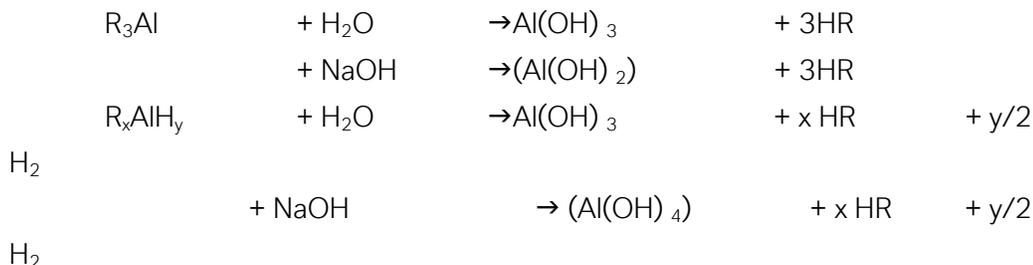
The alcohols can be mixed with gasoline in order to lower the intensity of the decomposition reactions.

Alcohols, preferably isopropanol, should be used as solvolysing agents for the disposal of oily waste.

In the aqueous solvolysis system addition of caustic soda is recommended, since any solids which are formed are redissolved.

## Hydrolysis

In the hydrolysis of aluminum trialkyls the corresponding alkanes and aluminum hydroxide (or aluminates in the presence of caustic soda) are formed as by-products. From the decomposition of alkylaluminum hydrides hydrogen is also produced.



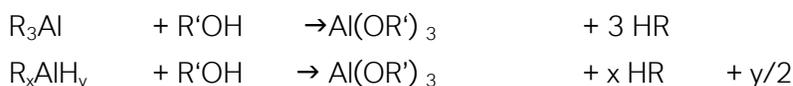
Alkylaluminum halides are hydrolyzed to alkanes and basic aluminum halides. The latter are further hydrolyzed to aluminum hydroxide and hydrohalic acids, e.g. hydrochloric acid.



Owing to the violence of the reaction the escape of acidic waste gases cannot be avoided, even in alkaline medium.

### **Alcoholysis**

If only small quantities of aluminum alkyl have to be disposed of in the laboratory, the product should be highly diluted and deactivated with a higher alcohol (e.g. isopropanol) by converting to an aluminum alcoholate. As with hydrolysis, the corresponding alkanes are again formed as by-products, and from the decomposition of hydrides, hydrogen in addition:



H<sub>2</sub>

However, in this case unlike the hydrolysis process, no acid waste gases are formed when halogenated alkyl wastes are disposed of in dry alcohol.

### **Burning of Waste Solutions containing Aluminum Alkyl**

When aluminum alkyls and alkylaluminum hydrides are burned, carbon dioxide, water vapour and aluminum oxide are formed. The ash may contain active aluminum.

During the combustion of alkylaluminum halides the corresponding hydrohalic acid is also formed.

Trialkylaluminums and dialkylaluminum hydrides develop a heat of combustion of approx. 45,000 kJ/kg.

With alkylaluminum chlorides the heats of combustion are lower, e.g. 30,000 kJ/kg for DEAC and 16,500 kJ/kg for EADC.

We have extensive experience in disposing of aluminum alkyl waste by burning, and will be pleased to advise you in any particular case.