Technical Bulletin

Using hydrofluoric acid

Also with low concentrations, work must take place safely!

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Introduction

The chemical substance hydrofluoric acid (or hydrogen fluoride), with chemical formula HF, is a non-oxidising mineral acid that because of its etching effect in diluted form is used for the composition of pickling and cleaning agents for chemical metal surface treatment. The substance 'hydrofluoric acid' does, however, have a particularly adverse effect: it is toxic.

Pickling agents for stainless steel are available in liquid form, as pickling spray or paste, packed small or in bulk, and used for pickling and passivation. The pickling process removes weld discoloration and restores the corrosion resistance of the stainless steel surface. Hydrofluoric acid in diluted form is also often used in a pickling solution for the chemical surface treatment of carbon steel systems such as vessels, piping and steam boiler installations.
The active percentages of hydrofluoric acid in these pickling agents vary from 0.5 to 7 per cent. Despite dilution it remains a highly toxic mixture that must be used professionally.

More information about chemical metal surface treatment can be found in our Technical Bulletins.

General

Hydrofluoric acid is a non-oxidising mineral acid. In pure form it is gaseous at room temperature, and a colourless liquid when diluted or at lower temperatures. It has a characteristic pungent odour and gives off corrosive fumes in the air that are heavier than air.
The toxicity has an immediate caustic effect on the skin, eyes and mucous membranes with deep (3rd degree) burns. In the body calcium compounds are extracted from the blood and bones by the reaction of the free fluoride ion. With concentrations lower than 20% the phenomena only occur later (sometimes after 24 hours) making diagnosis difficult. It has even been demonstrated that brief contact with a few drops on the skin with a low concentration of 3% hydrofluoric acid solution on a protected body part followed by a shower can cause a large reduction of calcium in the blood when hospitalised later. A fall in the calcium level in the blood can cause a cardiac arrest.

Work instructions and safety rules

Before starting to use cleaning products one must always first carefully read the product information sheets and safety instructions. These contain relevant information on the use of a product and the necessary protective measures.
Work instructions describing the minimum personal protective equipment and action to be taken are available in different forms depending on use, operating conditions and the company.
For more information on working safely we refer to our Technical Bulletin 2005/09, "working safely with stainless steel pickling compounds"

Experience has taught us that even with a low HF concentration a rapid fall in calcium in the blood is possible. This is why Vecom has tightened its personal protection policy for pickling sprays.
Spray pickling may only be carried out by persons wearing acid-proof pressurised suits with external oxygen supply (see photo above).
Persons carrying out spray pickling work must be in possession of a 'respiration certificate'.

First aid with injury and contact with hydrogen fluoride

- Ensure your own safety and bring the casualty to safety
- Check consciousness, respiration and blood circulation and calm the casualty

• Eyes	- Thoroughly rinse with water for 30 minutes using the eye-wash fountain - Also rinse with a calcium gluconate solution from time to time - Avoid physical exertion
• Mouth	- Drink 1 to 2 glasses of water
• Airways	- Give the casualty clean/fresh air - If necessary keep in a half-seated posture - Have the casualty drink 6 Calcium Sandoz Forte effervescent tablets (Belgium)
• Body parts	- Rinse affected parts for 30 minutes with water - Rub calcium gluconate gel or cream onto affected parts - Have the casualty drink 6 Calcium Sandoz Forte effervescent tablets (Belgium) (with burns larger than a palm of the hand)
• Clothing	- Remove contaminated clothing, but ensure your own safety
• Wounds	- Apply a sterile covering and stop any bleeding
• Casualty	- Do not allow to grow cold and keep the casualty at rest - Immediately take the casualty to a hospital or the nearest general practitioner. Also take the product information sheet and/or MSDS, the SIR card and telephone number of the medical officer with the casualty

When working with HF solutions one must always have at least a calcium gluconate gel/cream and calcium gluconate solution at hand.

The practitioner or hospital in the vicinity must be informed and be familiar with the treatment of HF injuries. They must also be given the instructions (see below).

For first aid with HF injuries Vecom has developed a special HF first aid kit which includes calcium gluconate injection ampoules for injections by the general practitioner (see photo).

The SIR card with first aid instructions and instructions for the hospital and general practitioner is available from
Stichting Industriële Reiniging, www.sir-safe.nl , info@sir-safe.nl
p.o. box 307, 3140 AH Maassluis, the Netherlands.

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