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TECHNICAL INFORMATION

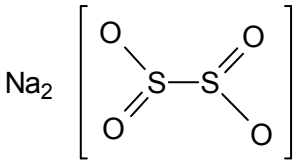
Reducing Agents

SODIUM HYDROSULFITE

Reducing Agent for Treatment of Chromium(VI)-containing Sewage

Chemical Characterization

BRUGGEMANN SODIUM HYDROSULFITE conc. powder is sodium dithionite, whose activity is between 88 and 92%.

Chemical structure	
Empirical formula	$Na_2S_2O_4$
Nomenclature	sodium dithionite, sodium disulphate(III)
CAS-Number	7775-14-6
Formula weight	174,1 g/mol
HS-Code	28 31 10 00

Properties

Appearance	colourless, deliquescent substance
Decomposition point	> 100°C (formation of sulphur dioxide)
Solubility in water (20°C)	230 g/l , in the presence of air fast decomposition
Solubility in alkalies	approx. 240 g/l (20°C), approx. 350 g/l (60°C)
Alkali resistance	slow decomposition
Acid resistance	immediate decomposition, formation of sulphur dioxide and other sulphur compounds
Odour	slight sulphur dioxide odour
pH-value (100 g/l, 20°C)	approx. 8,5 (inert gas atmosphere)

General Description

BRUGGEMANN SODIUM HYDROSULFITE contains 88 to 92% sodium dithionite. The reduction capacity of sodium dithionite depends on the pH-value. Although the reduction capacity in acid area is much higher than in alkaline, the reduction of chromium(VI) in alkaline medium is successful.

Under these conditions dithionite is oxidized to sulphite by handing over two electrons (1):

(1) $S_2O_4^{2-} + 4\ OH^- \longrightarrow 2\ SO_3^{2-} + 2\ e^- + 2\ H_2O$

In weakly alkaline to neutral area the oxidation proceeds up to the dithionate (2):

(2) $S_2O_4^{2-} + 4\ OH^- \longrightarrow 2\ S_2O_6^{2-} + 4\ e^- + 2\ H_2O$

In acid solution dithionite is oxidized by the dichromate up to the sulphate (3):

(3) $S_2O_4^{2-} + 4\ H_2O \longrightarrow 2\ HSO_4^- + 6\ e^- + 6\ H^+$

The reaction sequences (4) – (6) show, that the consumption of dithionite for the reduction of chromium (VI) is greatly dependent on the pH-value.
alkaline medium:

(4) $2\ CrO_4^{2-} + 3\ S_2O_4^{2-} + 2\ H_2O \longrightarrow 2\ Cr^{3+} + 6\ SO_3^{2-} + 4\ OH^-$

weakly alkaline to neutral medium:

(5) $4\ CrO_4^{2-} + 3\ S_2O_4^{2-} + 10\ H_2O \longrightarrow 4\ Cr^{3+} + 3\ S_2O_6^{2-} + 20\ OH^-$

acid medium:

(6) $Cr_2O_7^{2-} + S_2O_4^{2-} + 6\ H^+ \longrightarrow 2\ Cr^{3+} + 2\ SO_4^{2-} + 3\ H_2O$

The consumption of dithionite can not be exactly determined by stoichiometric calculations. The exact dosage rate should be determined by a laboratory test.
In comparison to the traditional chromium(VI) reduction by bisulfite with the application of sodium dithionite no acidification below pH 2,5 is necessary. Therefore no additional quantities of acid and alkali for the neutralisation must be inserted. The unnecessary entry of salting in the sewage can be avoided.
By the usage of SODIUM HYDROSULFITE the weakly acid pH-value of the chromium(VI)-containing sewage is sufficient. SODIUM HYDROSULFITE is therefore the current and environmental friendly reducing agent for the sewage treatment.
Furthermore SODIUM HYDROSULFITE is best suit for the reduction of chromium(VI) in cyanide-containing sewage. In this case cyanide is oxidized in strong alkaline medium and afterwards reduced by SODIUM HYDROSULFITE in still alkaline solution.

Safety advice

Safety data and information can be taken from the Material Safety Data Sheet

Package, delivery and storage

50 kgs polylined iron drums

100 kgs polylined iron drums

1000 kgs returnable containers (only SODIUM HYDROSULFITE S)

1200 kgs returnable containers (only SODIUM HYDROSULFITE N)

BRUGGEMANN SODIUM HYDROSULFITE can be delivered as SODIUM HYDROSULFITE N (standard quality) and SODIUM HYDROSULFITE S (reduced dust).
If kept properly in unopened drums or containers (dry/25°C) the shelf life of BRUGGEMANN SODIUM HYDROSULFITE conc. powder is at least 12 months.
Sodium Hydrosulfite must not be stored together with oxidizing substances or with acids.