1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND THE COMPANY/UNDERTAKING

Product code: M091
Product name: Formation Cleaning Solution M91
Company identification: Schlumberger Technology Corporation
110 Schlumberger Drive
Sugar Land, Texas 77478, USA
Telephone: 1-281-285-7873
Emergency telephone number: USA: 1-281-595-3518
Use of the Substance/Preparation: Used as a fracturing additive in oilfield applications.

2. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

DANGER
Main physical hazards: Oxidizer. Corrosive to metals.
Main health hazards: Causes severe eye burns. Causes skin irritation. May cause respiratory tract irritation. Causes irritation if swallowed. May cause nausea.
Other hazards: Liberates poisonous chlorine gas on contact with acid.
Precautions: Do not get on skin or clothing. Wash thoroughly after handling. Avoid contact with eyes. Keep container tightly closed.
HMIS classification: Health: 3 Flammability: 0 Physical hazard: 0 PPE: J, q, s
Form: Liquid Color: Light yellow Odor: Pungent

Principle routes of exposure: Eye contact. Skin contact.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Components classified as hazardous:

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No</th>
<th>Weight % - Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium hydroxide</td>
<td>1310-73-2</td>
<td>5 - 10</td>
</tr>
<tr>
<td>Sodium hypochlorite</td>
<td>7681-52-9</td>
<td>1 - 5</td>
</tr>
</tbody>
</table>

4. FIRST AID MEASURES

Eye contact: Immediately flush eyes with water for 30 minutes while holding eyelids open. Seek medical attention at once.
Skin contact: Take off contaminated clothing and shoes immediately. After contact with skin, wash immediately with plenty of soap and water for at least 15 minutes. Seek medical attention.
Ingestion: DO NOT induce vomiting. Rinse mouth. Call a physician or Poison Control Center immediately. Never give anything by mouth to an unconscious person.

Inhalation: Move to fresh air. Seek medical attention at once. If breathing has stopped, begin artificial respiration.

5. FIRE-FIGHTING MEASURES

Flash point: Does not flash.
Autoignition temperature: No data available.
Flammability limits in air:
- Lower: None
- Upper: None
Oxidizing properties: Oxidizer.

Reactivity data:
Liberates poisonous chlorine gas on contact with acid.

Suitable extinguishing media:
Use extinguishing media appropriate for surrounding material.

Extinguishing media which must not be used for safety reasons:
None known

Special exposure hazards arising from the substance or preparation itself, its combustion products, or released gases:
Releases toxic chlorine gas in contact with concentrated hydrochloric acid. Thermal decomposition can lead to release of irritating gases and vapors.

Special protective equipment for firefighters:
Wear protective fire fighting clothing and avoid breathing vapors. Use self-contained breathing apparatus in closed areas.

NFPA rating:
- Health: 3
- Flammability: 0
- Instability: 0
- Special: None

6. ACCIDENTAL RELEASE MEASURES

Main physical hazards: Oxidizer. Corrosive to metals.
Other hazards: Liberates poisonous chlorine gas on contact with acid.
Personal precautions: Do not get on skin or clothing. Wash thoroughly after handling. Use personal protective equipment. See also Section 8.
Methods for cleaning up: Dam up. Absorb spill with inert material (e.g. dry sand or earth), then place in a chemical waste container. After cleaning, flush away traces with water.

Environmental precautions: None known.

7. HANDLING AND STORAGE

Handling:
Precautions: Do not get on skin or clothing. Wash thoroughly after handling. Avoid contact with eyes. Keep container tightly closed.
Safe handling advice: Keep airborne concentrations below exposure limits. Do not breathe vapors or spray mist. Avoid contact with skin and eyes.

Technical measures/ storage conditions: Keep containers tightly closed in a dry, cool and well-ventilated place. Avoid contact with clothing, organics, or other combustible materials. Do not store or transport adjacent to corrosive materials, flammable/combustible materials, or reducing agents.

Packaging requirements: High density polyethylene (HDPE) drum or can.

Incompatible products: Do not store, transport with or allow to contact combustible materials, corrosives, reducing agents or dry ammonium salts. See also Section 10.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering measures to reduce exposure: Control the source. Local exhaust ventilation.

Hygiene measures: Avoid contact with skin, eyes and clothing. Do not breathe vapors or spray mist. Exercise reasonable care and cleanliness. Keep airborne concentrations below exposure limits.

Respiratory protection: In case of insufficient ventilation, wear suitable respiratory equipment. Use NIOSH approved respirator with organic vapor/acid gas protection (color coded yellow). Use SCBA (self contained breathing apparatus) in confined areas and for emergencies.

Eye protection: Tightly fitting safety goggles. Face-shield.

Hand protection: Impervious gloves made of: Neoprene.

Skin and body protection: Chemical resistant suit. Chemical resistant boots.

Occupational Exposure Limits

<table>
<thead>
<tr>
<th>Component</th>
<th>ACGIH - TLVs</th>
<th>OSHA - PELs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TWA / Ceiling</td>
<td>STEL</td>
</tr>
<tr>
<td>Sodium hydroxide</td>
<td>2 mg/m³ C</td>
<td></td>
</tr>
</tbody>
</table>

Nuisance dust: ACGIH: inhalable particulate TLV-TWA=10 mg/m³; respirable particulate TLV-TWA= 3 mg/m³
## 9. PHYSICAL AND CHEMICAL PROPERTIES

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical characterization</td>
<td>Aqueous solution of inorganic base. Oxidizer.</td>
</tr>
<tr>
<td>Form</td>
<td>Liquid</td>
</tr>
<tr>
<td>Color</td>
<td>Light yellow</td>
</tr>
<tr>
<td>Odor</td>
<td>Pungent</td>
</tr>
<tr>
<td>Odor threshold</td>
<td>No information available.</td>
</tr>
<tr>
<td>pH</td>
<td>No information available.</td>
</tr>
<tr>
<td>Boiling point/range</td>
<td>102 °C / 216 °F</td>
</tr>
<tr>
<td>Flash point</td>
<td>Does not flash.</td>
</tr>
<tr>
<td>Flammability limits in air</td>
<td></td>
</tr>
<tr>
<td>Lower</td>
<td>None</td>
</tr>
<tr>
<td>Upper</td>
<td>None</td>
</tr>
<tr>
<td>Bulk density</td>
<td>Not applicable.</td>
</tr>
<tr>
<td>Melting point/range</td>
<td>No data available.</td>
</tr>
<tr>
<td>Decomposition temperature</td>
<td>No data available.</td>
</tr>
<tr>
<td>Solubility</td>
<td></td>
</tr>
<tr>
<td>Water solubility</td>
<td>Soluble.</td>
</tr>
<tr>
<td>Fat solubility</td>
<td>No information available.</td>
</tr>
<tr>
<td>Partition coefficient (n-octanol/water)</td>
<td>No information available.</td>
</tr>
<tr>
<td>Relative density</td>
<td>1.2 (@ 27°C)</td>
</tr>
<tr>
<td>Vapor pressure</td>
<td>3.2 kPa (@ 75°C)</td>
</tr>
<tr>
<td>Vapor density</td>
<td>Similar to water.</td>
</tr>
<tr>
<td>Viscosity</td>
<td>No data available.</td>
</tr>
<tr>
<td>Evaporation rate</td>
<td>No data available.</td>
</tr>
<tr>
<td>% Volatile</td>
<td>90</td>
</tr>
</tbody>
</table>

## 10. STABILITY AND REACTIVITY

**Stability:**
Stable under recommended storage conditions.

**Conditions to avoid:**
See other information in this section.

**Incompatibility with other substances:**

**Hazardous decomposition products:**
Chlorine.

**Hazardous polymerization:**
Hazardous polymerization does not occur.

**Other hazards:**
Liberates poisonous chlorine gas on contact with acid.

## 11. TOXICOLOGICAL INFORMATION

### PRODUCT TOXICOLOGICAL INFORMATION

**Acute Health Hazard**
Eye contact: Corrosive. Rapidly causes pain, burns, corneal injury. May cause permanent damage and blindness.

Skin contact: Severe irritant; causes pain, redness, dermatitis or mild burn.

Ingestion: Irritant; may cause pain or discomfort to mouth, throat and stomach.

Inhalation: Irritant; may cause pain and coughing.

Sensitization - lung: Not known to cause allergic reaction.

Sensitization - skin: Not known to cause allergic reaction.

Chronic Health Hazard

Carcinogenic effects: None known.

Mutagenic effects: Not known to cause heritable genetic damage.

Teratogenic effects: Not known to cause birth defects or have a deleterious effect on a developing fetus.

Reproductive toxicity: Not known to adversely affect reproductive functions and organs.

Target organ effects: See COMPONENT TOXICOLOGICAL INFORMATION below.

COMPONENT TOXICOLOGICAL INFORMATION

<table>
<thead>
<tr>
<th>Component</th>
<th>Target Organ Effects</th>
<th>LD50 / LC50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium hydroxide</td>
<td>eyes, skin, respiratory system</td>
<td>= 1350 mg/kg (Dermal LD50; Rabbit)</td>
</tr>
<tr>
<td>Sodium hypochlorite</td>
<td></td>
<td>= 8200 mg/kg (Oral LD50; Rat)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt; 10000 mg/kg (Dermal LD50; Rabbit)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Component</th>
<th>OTHER TOXICOLOGICAL INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium hydroxide</td>
<td>EXTREMELY CORROSIVE to tissue (if &gt;25% solutions). Can cause blindness, permanent scarring and death. Aerosols can cause lung injury - effects may be delayed.</td>
</tr>
</tbody>
</table>

12. ECOLOGICAL INFORMATION

PRODUCT INFORMATION

COMPONENT INFORMATION

Sodium hydroxide

Bioaccumulation: Not applicable
Persistence / degradability: Not applicable.
Freshwater Fish Species Data = 45.4 mg/L (LC50; Oncorhynchus mykiss)

Sodium hypochlorite

Freshwater Algae Data = 0.095 mg/L (EC50; Skeletonema costatum)
Freshwater Fish Species Data 0.22 - 0.62 mg/L (LC50; Pimephales promelas) = 5.9 mg/L (LC50; Pimephales promelas)
Water Flea Data = 2.1 mg/L (EC50; Daphnia magna)

13. DISPOSAL CONSIDERATIONS

Waste from residues / unused products: Ship via permitted waste hauler to permitted hazardous waste disposal facility for chemical deactivation and solidification prior to land filling.

Contaminated packaging: Triple rinse, crush and ship to sanitary landfill unless prohibited by local regulations. If reusable containers are used, send them back to the product supplier, after the required rinsing.
14. TRANSPORT INFORMATION

**DOT:**

<table>
<thead>
<tr>
<th>UN/NA Number:</th>
<th>UN 3266</th>
</tr>
</thead>
<tbody>
<tr>
<td>CERCLA RQ:</td>
<td>200 gallons (sodium hypochlorite).</td>
</tr>
</tbody>
</table>

- **Packing size:** < 200 gals
- **Hazard class:** 8
- **Proper shipping name:** Corrosive liquid, basic, inorganic, n.o.s. (contains sodium hydroxide, sodium hypochlorite), 8, UN 3266, PG II
- **Label(s):** Corrosive 8

- **Packing size:** > 200 gals
- **Hazard class:** 8
- **Proper shipping name:** Corrosive liquid, basic, inorganic, n.o.s. (contains sodium hydroxide, sodium hypochlorite), 8, UN 3622, PG II, RQ
- **Label(s):** Corrosive 8

**IMDG/IMO**

- **Shipping name:** CORROSIVE LIQUID, BASIC, INORGANIC, N.O.S. (contains sodium hydroxide, sodium hypochlorite)
- **Label(s):** Corrosive 8
- **Class or Div.:** 8
- **UN number:** UN 3266
- **Packing group:** II
- **EMS:** F-A, S-B

**ICAO/IATA**

- **Shipping name:** Corrosive liquid, basic, inorganic, n.o.s. (contains sodium hydroxide, sodium hypochlorite)
- **Label(s):** Corrosive 8
- **Class or Div.:** 8
- **UN number:** UN 3266
- **Packing group:** II
- **Packing instruction** (passenger aircraft): 808
- **Max Net Qty/Pkg:** 1 L
- **Packing instruction** (cargo aircraft): 812
- **Max Net Qty/Pkg:** 30 L

**TDG (Canada):**

- **Shipping name:** CORROSIVE LIQUID, BASIC, INORGANIC, N.O.S. (contains sodium hydroxide, sodium hypochlorite), 8, UN 3266, PG II
- **Label(s):** Corrosive 8
- **PIN:** UN 3266
- **Class:** 8

*Note 1:*
For the applicable placard selection refer to the appropriate transport regulations; the selection may vary depending on the cargo size and categories of other hazardous materials in the cargo.

15. REGULATORY INFORMATION
International Inventories

Inventory - United States TSCA - This product complies with TSCA requirements.
Canada DSL Inventory List - This product complies with DSL requirements.
EC-No This product complies with EINECS/ELINCS requirements.
Inventory - Japan - Existing and New Chemicals list - This product does not comply with JPENCS
China inventory of existing chemical substances list - This product complies with China inventory requirements.
Australia (AICS): All the constituents of this material are listed on the Australian Inventory of Chemical Substances (AICS).

Hazard Class

WHMIS Hazard Class: E (CORROSIVE MATERIAL), D2B (Other Toxic Effects - Toxic Material)

16. OTHER INFORMATION

Current references:
1. Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices. American Conference of Governmental Industrial Hygienists, Cincinnati OH.
4. NIOSH Registry of Toxic Effects of Chemical Substances (RTECS). National Institute for Occupational safety and Health, Cincinnati, OH.
5. LOLI Database.

Explanation of terms:
ACGIH: American Conference of Governmental Industrial Hygienist
ACGIH-TL: Threshold Limit Value
DSL: Domestic Substance List
HMIRC: Hazardous Materials Information Review Commission
IARC: International Agency for Research on Cancer
NTP: National Toxicology Program
NIOSH: National Institute of Occupational Safety & Health
NIOSH-REL: Recommended Exposure Limit
OSHA: Occupational Safety & Health Administration
OSHA-PEL: Permissible Exposure Limit
TSCA: Toxic Substance Control Act (Inventory)

Occupational Exposure Limits indicators: TWA - Time Weighted Average; STEL - Short Term Limit; C - Ceiling Limit; units: [mg/m³]

ACGIH Notations:
"Skin" refers to the potential significant contribution to the overall exposure by the cutaneous route, including mucous membranes and the eyes, either by contact with vapors or by direct skin contact with the substance.
"A" notation indicates carcinogenicity as follows:
ACGIH classification: A1 - Confirmed Human Carcinogen; A2 - Suspected Human Carcinogen; A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans; A4 - Not Classifiable as a Human Carcinogen; A5 - Not suspected as a Human Carcinogen.
"SEN" refers to the potential for an agent to product sensitization as confirmed by human and animal data.

Section(s) revised: MSDS fully updated in the new database.
Additional advice: Consult your supplier if the material is to be used for special applications such as in the food industry or for hygiene, medical or surgical end-use.

Prepared by: Well Services Safety & Environment (WSSE)
Revision date: 18 April 2006
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End of the Material Safety Data Sheet