SAFETY DATA SHEET

[SECTION 1]: PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name : APG W Series – W02, W05, W10F Ferrofluid
Chemical Name : Proprietary Product
Chemical Formula : Mixture
Chemical Family : Colloidal Dispersion
Relevant Identified Use : Audio Loudspeakers, Heat Radiation
Uses Advised Against : Not intended for continued contact with skin

Manufacturer’s Name : Ferrotec Corporation, 1-4 Midoridaira, Sosa City, Chiba 289-2131, Japan
Importers / Distributor : Ferrotec (USA) Corporation, 33 Constitution Dr., Bedford, NH 03110, USA
Responsible Party : Ferrofluid-Safety@ferrotec.com
Telephone Number : (603) 472-6800
Emergency Tel. Number : +1 (800)424-9300 (CHEMTREC – US only)
                        +1 (703)527-3887 (CHEMTREC – International)

Other safety information : +81-479-73-6752 (FERROTEC CORP. – Japan)
                          +49-7022-9270-0 (FERROTEC GmbH – Germany)

[SECTION 2]: HAZARD IDENTIFICATION

Skin Corrosion / Irritation: Category 2
Severe Eye Damage / Irritation: Category 2
Target Organs : Not Established

GHS Label Elements, including precautionary statements

Pictogram:

! [Image]

Signal word: Warning

Hazard statement(s):
H315 Cause skin irritation
H319 Cause serious eye irritation

Precautionary statement(s):
-Prevention
P264 Wash thoroughly after handling
P273 Avoid release to the environment
P280 Wear protective gloves / protective clothing / eye protection / face protection.
-Response
P302+P352 If on skin: Wash with plenty of soap and water
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if possible and easy to do. Continue rinsing.
P332+P313: IF skin irritation occurs: Get medical advice/attention.
P337+P313: If eye irritation persists: Get medical advice/attention.
P362 Take off contaminated clothing and wash before reuse.
P391 Collect spillage

Any hazards not otherwise classified or identified during classification process: N/A

% of mixture consisting of ingredient(s) of unknown toxicity: N/A

HMIS Classification
Health hazard: 1
Chronic Health Hazard: 0
Flammability: 0
Physical hazards: 0

NFPA Rating
Health hazard: 1
Fire: 0
Reactivity Hazard: 0

Potential Health Effects

Inhalation: May cause slight irritation
Skin: Prolonged exposure may cause slight skin irritation
Eyes: May cause slight irritation
Ingestion: May cause slight irritation to lung tissue if aspirated when swallowed

[SECTION 3]: COMPOSITION / INGREDIENT INFORMATION

Synonyms: N/A

The precise composition of this mixture is proprietary information.

A more complete disclosure will be provided to a physician or a nurse in the event of a medical emergency. All components are registered in Chemical Abstracts Service (CAS).

<table>
<thead>
<tr>
<th>Composition</th>
<th>Proportion % (by volume)</th>
<th>Exposure Limit</th>
<th>Toxicity Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Magnetite (Fe₃O₄)</td>
<td>21.6 – 41.5</td>
<td>Not Determined</td>
<td>N/A</td>
</tr>
<tr>
<td>B Polyolefin Anhydride Dispersant</td>
<td>7.6 – 21.9</td>
<td>Not Determined</td>
<td>N/A</td>
</tr>
<tr>
<td>C Synthetic Ester Oil</td>
<td>38.9 - 61.7</td>
<td>Not Determined</td>
<td>N/A</td>
</tr>
<tr>
<td>D Oil Soluble Additive</td>
<td>3.1 – 3.8</td>
<td>Not Determined</td>
<td>N/A</td>
</tr>
</tbody>
</table>
[SECTION 4]: FIRST AID MEASURES

Necessary measures to be taken according to route(s) of exposure - 
Ingestion: Rinse mouth and give moderate amount of water to drink. Do not induce vomiting unless directed by medical professional. If vomiting does occur, the head should be kept lower than the torso so as to prevent aspiration into the lungs.
Eye contact: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting eyelids. Check for and remove contact lenses. Get medical attention.
Skin Contact: Wash contaminated skin with soap and water. Remove contaminated clothing and shoes. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse.
Inhalation: Move person to fresh air. If person is not breathing, call for emergency assistance (911 or other emergency number) then give artificial respiration, preferably mouth-to-mouth if possible. Call a poison control center or doctor for further treatment advice.
Most important symptoms/effects: N/A
Acute: N/A
Delayed: N/A

Indication of immediate medical attention and special treatment needed, if necessary: N/A

Notes to physicians: This product may cause slight skin and/or eye irritation. Treatment is symptomatic and supportive.

[SECTION 5]: FIRE FIGHTING MEASURES

Suitable extinguishing media: N/A
Unsuitable extinguishing media: N/A
Specific hazards arising from chemical combustion products: N/A
Special protective equipment and precautions for fire-fighters: N/A

[SECTION 6]: ACCIDENTAL RELEASE MEASURES

Steps to be taken in case material is released or spilled:
Personal precautions: Wear rubber (latex or nitrile) gloves and eye protection if splash is possible.
Environmental Precautions: Remove free liquid. Add absorbent (sand, earth, sawdust) to spill area. After removing absorbent, wash surface with soap and water to reduce possible slipping hazard.
Methods and materials for containment and cleanup: Consult federal, state and local regulations applicable to disposal of wastewater.

[SECTION 7]: HANDLING AND STORAGE

Precautions for safe handling: Ordinary care in handling of chemicals. Wash hands after handling.
Conditions for safe storage: Store in a cool, dry area.
Other precautions: Avoid contamination of food or tobacco products. Users should be aware that a very small percentage of the population may display unexpected allergic skin reactions to otherwise innocuous industrial chemicals and raw materials.
[SECTION 8]: EXPOSURE CONTROLS / PERSONAL PROTECTION

OSHA permissible exposure limit (PEL): Not established
ACGIH Threshold Limit Value (TLV): Not established
Any other exposure limit used or recommended by the chemical manufacturer, importer, or employer preparing the safety data sheet, where available: N/A

Appropriate engineering controls: Emergency eye wash and shower should be available in the workplace.

Personal Protective Measures/Equipment:
  Respiratory protection: None required unless smoke, mists or vapors are produced.
  Ventilation: No special ventilation required
  Hand protection: Rubber or plastic gloves conforming to EN 374 (EU) to prevent prolonged or repeated contact with skin
  Eye protection: Safety glasses conforming to EN 166 (EU) if splash is possible
  Other protective equipment: Not needed

[SECTION 9]: PHYSICAL AND CHEMICAL PROPERTIES

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Blackish brown fluid</td>
</tr>
<tr>
<td>Odor:</td>
<td>Mild faint</td>
</tr>
<tr>
<td>Odor Threshold:</td>
<td>Not established</td>
</tr>
<tr>
<td>pH:</td>
<td>N/A</td>
</tr>
<tr>
<td>Melting/Freezing Point (°C):</td>
<td>N/A</td>
</tr>
<tr>
<td>Boiling Point (°C):</td>
<td>221 with decomposition</td>
</tr>
<tr>
<td>Flash Point (°C):</td>
<td>&gt; 200°C</td>
</tr>
<tr>
<td>Evaporation Rate:</td>
<td>5.0 – 10^-7 g/cm^2 sec at 175°C</td>
</tr>
<tr>
<td>Flammability (solid/gas):</td>
<td>N/A</td>
</tr>
<tr>
<td>Explosive properties:</td>
<td>N/A</td>
</tr>
<tr>
<td>Lower /Upper Explosion Limits:</td>
<td>N/A</td>
</tr>
<tr>
<td>Vapor Pressure (kPa @20 °C):</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Vapor Density (Air=1):</td>
<td>N/A</td>
</tr>
<tr>
<td>Density (g/cm^3):</td>
<td>1.16 – 1.38 @ 25°C</td>
</tr>
<tr>
<td>Water Solubility:</td>
<td>Insoluble</td>
</tr>
<tr>
<td>Partition Coefficient:</td>
<td>n-octanol/water: Not established</td>
</tr>
<tr>
<td>Auto-ignition Temperature:</td>
<td>Not established</td>
</tr>
<tr>
<td>Decomposition Temp.:</td>
<td>Not established</td>
</tr>
<tr>
<td>Viscosity (mPa·s):</td>
<td>175 – 1000 cP</td>
</tr>
</tbody>
</table>

[SECTION 10]: STABILITY AND REACTIVITY

Reactivity Information
Chemical stability: Stable at normal temperatures and pressure
Possibility of hazardous reactions: Will not occur
Conditions to avoid (e.g. static discharge, shock or vibration): heat and flame
Incompatible materials: Strong oxidizing material
Hazardous decomposition products: N/A

[SECTION 11]: TOXICOLOGICAL INFORMATION
Acute Toxicity
Oral LD50
LD50 Oral – Not established

Inhalation LC50
LC50 Inhalation – Not established

Dermal LD50
LD50 Dermal – Not established

Other information on acute toxicity
Skin corrosion/irritation: This product may irritate skin with prolonged contact.
Serious eye damage/eye irritation: product may irritate eyes.
Respiratory or skin sensitization: No data
Germ cell mutagenicity: No data
Carcinogenicity: No data
IARC: No data
NTP: No data
OSHA: No data
Reproductive Toxicity: No data
Teratogenicity: No data

Specific target organ toxicity – single exposure (Globally Harmonized System): No data
Specific target organ toxicity – repeated exposure (Globally Harmonized System): No data

Aspiration hazard: If this material is aspirated, move person to fresh air. If person is not breathing, call for emergency assistance (911 or other emergency number) then give artificial respiration, preferably mouth-to-mouth if possible. Call a poison control center or doctor for further treatment advice.

Potential health effects
Inhalation: Not established
Ingestion: Not established
Skin: Not established
Eyes: Not established

Signs and Symptoms of Exposure: Not established
Synergistic effects: Not established
Additional Information: N/A

[SECTION 12]: ECOLOGICAL INFORMATION
Ecotoxicity (Aquatic and Terrestrial toxicity): No data
Persistence and biodegradability: No data
Bioaccumulative potential: No data
Mobility in soil: No data
Other adverse effects: No data

[SECTION 13]: DISPOSAL CONSIDERATION

Product: Comply with all federal, state and local regulations.
Do not dump this product into sewers, on the ground or into any body of water.

Contaminated packaging: Dispose of as unused product.

[SECTION 14]: TRANSPORT INFORMATION

DOT (US)
Hazard class: N/A
UN No: N/A
Packing Group: N/A
Proper bulk shipping description: Not regulated
Proper non-bulk shipping description: Not regulated
Reportable Quantity: N/A
Marine Pollutant: N/A
Poison Inhalation Hazard: N/A

IMDG
Hazard class: N/A
UN No: N/A
Packing Group: N/A
Proper bulk shipping description: Not regulated
Proper non-bulk shipping description: Not regulated

ICAO shipping description: Not regulated
ADR/RID hazard class: Not regulated

IATA
Hazard class: N/A
UN No: N/A
Packing Group: N/A
Proper bulk shipping description: Not regulated
Proper non-bulk shipping description: Not regulated

[SECTION 15]: REGULATORY INFORMATION

OSHA Hazards: N/A

DSL Status: N/A

SARA 302 Components: None

SARA 313 Components: None
<table>
<thead>
<tr>
<th>Composition</th>
<th>CAS No.</th>
<th>TSCA</th>
<th>EINECS</th>
<th>OSHA</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Iron oxide (magnetite)</td>
<td>1309-38-2</td>
<td>Registered</td>
<td>Registered</td>
<td>Registered</td>
</tr>
<tr>
<td>B Maleic Anhydride Dispersant</td>
<td>108-31-6</td>
<td>Registered</td>
<td>Registered</td>
<td>Registered</td>
</tr>
<tr>
<td>C Synthetic Ester Oil</td>
<td>Proprietary</td>
<td>Registered</td>
<td>Registered</td>
<td>Registered</td>
</tr>
<tr>
<td>D Oil Soluble Additive</td>
<td>Proprietary</td>
<td>Registered</td>
<td>Registered</td>
<td>Registered</td>
</tr>
</tbody>
</table>

These components do not contain any chemical subject to the reporting requirements of Section 313 of Title III of the Superfund Amendment and Reauthorization Act (SARA) of 1986 and 40 CFR part 372.

[SECTION 16]: OTHER INFORMATION

We believe the statements, technical information and recommendations contained herein to be reliable, but they are given without warranty or guarantee of any kind, express or implied, and we assume no responsibility for any loss, damage or expense, direct or consequential, arising from their use.

This material is not sold for use in products for which prolonged contact with skin or implantation into the human body is intended. We do not recommend this material as safe and effective for such uses and assume no liability for any such use.

RoHS compliance statement: We believe this product to be RoHS compliant.

REACH 2 Compliance Statement: We believe this product to be REACH 2 compliant.

Date of preparation: 2015-115-30          Date of last revision and revision level: 2020-01-09, Rev. F