SAFETY DATA SHEET
SDS No. TAZG-14E01  Date: 06.06.2014

PZT Sol-Gel Solution N-Series

1. SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1 Product identifier
Product Name
PZT Sol-Gel Solution N-Series.
CAS No.
Mixture.
EINECS No.
Mixture.
REACH Registration No.
None assigned.

1.2 Relevant identified uses of the substance or mixture and uses advised against
Identified Use(s)
Thin film forming for electric devices.
Uses Advised Against
For professional users only.

1.3 Details of the supplier of the safety data sheet
1.3.1 Manufacturer
MITSUBISHI MATERIALS CORPORATION Sanda Plant
12-6 Techno Park, Sanda-cho
Hyogo, Japan 669-1339.

Telephone
+81-79-568-2344
Fax
+81-79-568-2342
E-Mail (competent person)
kinouei@mmc.co.jp

1.4 Emergency telephone number
Emergency Phone No.
+81-79-568-2344 [9:00 – 17:00 JST (GMT+9)].

2. SECTION 2: HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

2.1.1 Regulation (EC) No. 1272/2008 (CLP)
Flam. Liq. 3; H226
Skin Sens. 1; H317
Eye Dam. 1; H318
Repr. Cat 1; H360Df
STOT RE 2; H373
STOT SE 3; H335
Aquatic Acute 1; H400
Aquatic Chronic 1; H410

R10: Flammable.
R43: May cause sensitization by skin contact.
Xi: R41: Risk of serious damage to eyes.
Repr. Cat 1; R61: May cause harm to the unborn child.
Repr. Cat 3; R62: Possible risk of impaired fertility.
Xn; R48/20/22: Harmful: danger of serious damage to health by prolonged exposure through inhalation and if swallowed.
R67: Vapours may cause drowsiness and dizziness.
N; R50/53: Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

2.2 Label elements
Product Name
Contains:
PZT Sol-Gel Solution N-Series.
Lead di(acetate), Zirconium tetrabutanolate, butan-1-ol and Titanium tetraisopropanolate

Signal Word(s)
DANGER
### 2.3 Other hazards

None known.

### 3. SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

#### 3.2 Mixture

**EC Classification No. 1272/2008**

<table>
<thead>
<tr>
<th>Hazardous Ingredient(s)</th>
<th>%/W/W</th>
<th>CAS No.</th>
<th>EC No.</th>
<th>REACH Registration No.</th>
<th>Hazard Pictogram(s) and Hazard Statement(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead di(acetate)</td>
<td>10 - 40</td>
<td>301-04-2</td>
<td>206-104-4</td>
<td>None assigned</td>
<td>Repr 1A; H360Df; STOT RE 2; H373 Aquatic Acute 1; H400 Aquatic Chronic 1; H410</td>
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<tr>
<td>Zirconium tetrabutanolate</td>
<td>5 - 20</td>
<td>1071-76-7</td>
<td>213-995-3</td>
<td>None assigned</td>
<td>Flam. Liq. 3; H226; Skin Sens. 1; H317 Eye Irrit. 2; H319</td>
</tr>
<tr>
<td>Titanium tetraisopropanolate</td>
<td>5 - 20</td>
<td>546-58-9</td>
<td>208-909-6</td>
<td>None assigned</td>
<td>Flam. Liq. 3; H226; Eye Irrit. 2; H319 STOT SE 3</td>
</tr>
<tr>
<td>Ethanol</td>
<td>20 - 50</td>
<td>64-17-5</td>
<td>200-578-6</td>
<td>None assigned</td>
<td>Flam. Liq. 2; H226</td>
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<tr>
<td>Butan-1-ol</td>
<td>1 - 5</td>
<td>71-38-3</td>
<td>200-751-6</td>
<td>None assigned</td>
<td>Flam. Liq. 3; H226 Acute Tox. 4; H302 Skin Irrit. 2; H315 Eye Dam. 1; H318 STOT SE 3; H335 STOT SE 3; H336</td>
</tr>
<tr>
<td>Octan-1-ol</td>
<td>1 - 5</td>
<td>111-87-5</td>
<td>203-917-6</td>
<td>None assigned</td>
<td>Eye Irrit. 2; H319 Aquatic Chronic 3; H412</td>
</tr>
<tr>
<td>Propylene glycol</td>
<td>5 - 20</td>
<td>57-55-6</td>
<td>200-338-0</td>
<td>None assigned</td>
<td>Not classified</td>
</tr>
</tbody>
</table>
## 4. SECTION 4: FIRST AID MEASURES

### 4.1 Description of first aid measures

#### Inhalation

IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. Call a POISON CENTER/doctor if you feel unwell.

#### Skin Contact

IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower. Wash with plenty of soap and water. Take off contaminated clothing and wash before reuse. If irritation (redness, rash, blistering) develops, get medical attention.

#### Eye Contact

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor/physician.

#### Ingestion

IF SWALLOWED: Rinse mouth. Call a POISON CENTER or doctor/physician if you feel unwell. Do not induce vomiting unless instructed to do so by medical personnel.

### 4.2 Most important symptoms and effects, both acute and delayed

Causes serious eye damage. Irritating to respiratory system. May cause damage to organs through prolonged or repeated exposure: Central nervous
4.3 Indication of any immediate medical attention and special treatment needed

system, Reproductive system. May damage the unborn child. Suspected of damaging fertility.
Treat symptomatically. IF exposed or concerned: Get medical advice/attention.

5. SECTION 5: FIRE-FIGHTING MEASURES

5.1 Extinguishing media
Suitable Extinguishing Media
Foam, CO2 or dry powder, Water spray.

5.2 Special hazards arising from the substance or mixture
Flammable liquid and vapour. Vapours are heavier than air and may travel considerable distances to a source of ignition and flashback. Combustion may cause toxic fumes. (Carbon monoxide, Carbon dioxide, metal oxides).
Fire fighters should wear complete protective clothing including self-contained breathing apparatus. Do not breathe fumes. Keep containers cool by spraying with water if exposed to fire. Prevent liquid entering sewers, basements and any waterscourses.

5.3 Advice for fire-fighters
Do not use water jet. Direct water jet may spread the fire.

6. SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Eliminate sources of ignition. Ensure adequate ventilation. Wear appropriate personal protective equipment, avoid direct contact.

6.2 Environmental precautions
Avoid release to the environment. Do not allow to enter drains, sewers or watercourses. Prevent liquid entering sewers, basements and work areas; vapour may create explosive and toxic atmosphere.

6.3 Methods and material for containment and clean up
Cover spills with inert absorbent material. Transfer to a container for disposal or recovery. Ventilate the area and wash spill site after material pick-up is complete. Dispose of this material and its container as hazardous waste.

6.4 Reference to other sections
See also Section 8 and 13.

6.5 Additional Information
None.

7. SECTION 7: HANDLING AND STORAGE

7.1 Precautions for safe handling
Do not handle until all safety precautions have been read and understood.
Provide adequate ventilation. Use explosion-proof electrical/ventilating/lighting/equipment. Use only non-sparking tools. Keep away from heat/sparks/open flames/hot surfaces. – No smoking. Avoid breathing vapours. Avoid contact with skin and eyes. Wear protective gloves/protective clothing/eye protection/face protection. Wash hands thoroughly after handling.
Do not eat, drink or smoke when using this product.
Store locked up. Store in a well-ventilated place. Keep container tightly closed.

7.2 Conditions for safe storage, including any incompatibilities
Keep cool.
Stable under normal conditions.
Strong oxidising agents, Strong Acids, Alkalis.
Keep only in original container.
Thin film forming for electric devices.

7.3 Specific end use(s)
8. SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

8.1.1 Occupational Exposure Limits

<table>
<thead>
<tr>
<th>SUBSTANCE</th>
<th>CAS No.</th>
<th>LTEL (8 hr TWA ppm)</th>
<th>LTEL (8 hr TWA mg/m³)</th>
<th>STEL (ppm)</th>
<th>STEL (mg/m³)</th>
<th>Note:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Butan-1-ol</td>
<td>71-36-3</td>
<td>-</td>
<td>-</td>
<td>50</td>
<td>154</td>
<td>WEL, Sk - Can be absorbed through skin.</td>
</tr>
<tr>
<td>Propane-1,2-diol</td>
<td>57-55-6</td>
<td>150</td>
<td>474</td>
<td>-</td>
<td>-</td>
<td>WEL, Total Vapour and Particulate.</td>
</tr>
<tr>
<td>Ethanol</td>
<td>64-17-5</td>
<td>1000</td>
<td>1920</td>
<td>-</td>
<td>-</td>
<td>WEL, Particulate.</td>
</tr>
</tbody>
</table>

Source: WEL: Workplace Exposure Limit (UK HSE EH40).

8.1.2 Biological limit value

8.1.3 PNECs and DNELs

8.2 Exposure controls

8.2.1 Appropriate engineering controls

8.2.2 Personal protection equipment

Eye/face protection

Skin protection

Hand protection: Wear impervious gloves (EN374). Recommended: Butyl rubber, Nitrile rubber. Breakthrough time of the glove material: refer to the information provided by the gloves’ producer.

Body protection: Wear safety or chemical resistant shoes or boots.

Respiratory protection

Use with ventilation. In case of insufficient ventilation, wear suitable respiratory equipment. A suitable mask with filter type A (EN141 or EN405) may be appropriate.

Thermal hazards

Not applicable.

Avoid release to the environment.

8.2.3 Environmental Exposure Controls

9. SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance

Brown liquid

Odour

Pungent.

Odour Threshold

Not available.

pH

Not available.

Melting Point/Freezing Point

-89.5°C (Butan-1-ol).

Initial boiling point and boiling range

117°C (Butan-1-ol).

Flash point

29°C.

Evaporation rate

Not available.

Flammability (solid, gas)

Flam. Liq. 3; Flammable liquid and vapour.

Upper/lower flammability or explosive limits

1.4-11.2Vol-%.

Vapour pressure

6.7mm Hg @ 25°C.

Vapour density

2.6.

Relative density

Not available.

Solubility(ies)

Water: Slightly soluble.

Partition coefficient: n-octanol/water

Not available.
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9.2 Other information

10. SECTION 10: STABILITY AND REACTIVITY

10.1 Reactivity
10.2 Chemical stability
10.3 Possibility of hazardous reactions
10.4 Conditions to avoid
10.5 Incompatible materials
10.6 Hazardous decomposition product(s)

Stable under normal conditions.
Stable under normal conditions.
Vapours are heavier than air and may travel considerable distances to a source of ignition and flashback.
Keep away from heat and sources of ignition.
Strong oxidising agents. Strong Acids, Alkalis.
Carbon monoxide, Carbon dioxide, metal oxides.

11. SECTION 11: TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects
11.1.1 Acute toxicity

Ingestion
Inhalation
Skin Contact
Skin corrosion/irritation
Serious eye damage/irritation
Respiratory or skin sensitization
Germ cell mutagenicity
Carcinogenicity
Reproductive toxicity

Based upon the available data, the classification criteria are not met.
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Eye Dam. 1; Causes serious eye damage. (Butan-1-ol)
Skin Sens. 1; May cause an allergic skin reaction. (Zirconium tetrabutanolate)

Repr. 1A; May damage the unborn child. Suspected of damaging fertility (Lead di(acetate))
STOT SE 3; May cause drowsiness and dizziness.
STOT RE 2; May cause damage to organs through prolonged or repeated exposure: Oral/inhalation: Central nervous system, Reproductive system (Lead di(acetate))

Aspiration hazard

Based upon the available data, the classification criteria are not met.

12. SECTION 12: ECOLOGICAL INFORMATION

12.1 Toxicity

Aquatic Acute 1; Very toxic to aquatic life.
Aquatic Chronic 1; Very toxic to aquatic life with long lasting effects.
Estimated LC50 <1 mg/l (Mixture)

12.2 Persistence and degradability

Part of the components are biodegradable. (Ethanol, Butan-1-ol)

12.3 Bioaccumulative potential

The product has low potential for bioaccumulation.

12.4 Mobility in soil

Slightly soluble in: Water. The product is predicted to have low mobility in soil.

12.5 Results of PBT and VVFB assessment

No data (Mixture).

12.6 Other adverse effects

None known.

13. SECTION 13: DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods
13.2 Additional Information

Dispose of contents/container to: Suitable incineration plant.
This material and its container must be disposed of as hazardous waste (2008/98/EEC). Disposal should be in accordance with local, state or national legislation. Avoid release to the environment.
14. SECTION 14: TRANSPORT INFORMATION

14.1 UN number
UN1993

14.2 Proper Shipping Name
FLAMMABLE LIQUID
N.O.S. (CONTAINS ETHANOL)

14.3 Transport hazard class(es)
ADR/RID
IMDG
IATA/ICAO

14.4 Packing group
ADR
IMDG
IATA/ICAO

14.5 Environmental hazards
ADR
IMDG
IATA/ICAO

14.6 Special precautions for user
ADR
IMDG
IATA/ICAO

14.7 Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code
ADR
IMDG
IATA/ICAO

14.8 Additional Information
ADR
IMDG
IATA/ICAO

15. SECTION 15: REGULATORY INFORMATION

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

15.1.1 EU regulations
REACH - Annex XVII (Restrictions)
RoHS (Restriction of Hazardous Substances) Directive
REACH - SVHC Candidate List
RoHS - EEE Substance Inventory

15.1.2 National regulations
Germany

15.2 Chemical Safety Assessment
Water hazard class: 3

16. SECTION 16: OTHER INFORMATION

The following sections contain revisions or new statements: 1-16.

References: Existing Safety Data Sheet (SDS) and Existing ECHA registration(s) for Lead di(acetate) (CAS No. 301-04-2), Titanium tetraisopropionate (CAS No. 546-68-9), Ethanol (CAS No. 64-17-5), Butan-1-ol (CAS No. 71-36-3), Octan-1-ol (CAS No. 111-87-5), Propylene glycol (CAS No. 57-55-6), the Classification and Labelling Inventory for Zirconium tetrabutylacolate (CAS No. 1071-76-7).

<table>
<thead>
<tr>
<th>Classification of the substance or mixture According to Regulation (EC) No. 1272/2008 (CLP)</th>
<th>Classification Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flam. Liq. 3</td>
<td>Test Result (Closed cup)</td>
</tr>
<tr>
<td>Skin Sens. 1</td>
<td>Threshold Calculation</td>
</tr>
<tr>
<td>Eye Dam. 1</td>
<td>Threshold Calculation</td>
</tr>
<tr>
<td>Repr. 1A</td>
<td>Threshold Calculation</td>
</tr>
<tr>
<td>STOT RE 2</td>
<td>Threshold Calculation</td>
</tr>
<tr>
<td>STOT SE 3</td>
<td>Threshold Calculation</td>
</tr>
<tr>
<td>Aquatic Acute 1</td>
<td>Summation Calculation</td>
</tr>
<tr>
<td>Aquatic Chronic 1</td>
<td>Summation Calculation</td>
</tr>
</tbody>
</table>

LEGEND

LTGEL: Long Term Exposure Limit
 STEL: Short Term Exposure Limit
 DNEL: Derived No Effect Level
 PNEC: Predicted No Effect Concentration
 PBT: Persistent, Bioaccumulative and Toxic
 vPvB: vPvT: very Persistent and very Toxic
 OECD: Organisation for Economic Cooperation and Development
Training advice: Consideration should be given to the work procedures involved and the potential extent of exposure as they may determine whether a higher level of protection is required.

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Annex to the extended Safety Data Sheet (eSDS)
Not available.