# GHS Classification

## ID282 1,1'-Dimethyl-4,4'-bipyridinium salts (except paraquat dichloride)

**CAS 4685-14-7** Date Classified: Jun. 20, 2006 (Environmental Hazards: Mar. 31, 2006)

Reference Manual: GHS Classification Manual (Feb. 10, 2006)

### Physical Hazards

| Hazard class | | Classification | symbol | signal word | hazard statement | Rational for the classification |
|---|---|---|---|---|---|---|
| 1 | Explosives | Not applicable | – | – | – | Containing no chemical groups with explosive properties: commercial 1,1'-dimethyl-4,4'-bipyridinium=diiodide and 1,1'-dimethyl-4,4'-bipyridinium=dimethylsulfate (WHO, 1991) |
| 2 | Flammable gases | Not applicable | – | – | – | Classified as "solid" according to GHS definition: commercial 1,1'-dimethyl-4,4'-bipyridinium=diiodide and 1,1'-dimethyl-4,4'-bipyridinium=dimethylsulfate (WHO, 1991) |
| 3 | Flammable aerosols | Not applicable | – | – | – | Not aerosol products |
| 4 | Oxidizing gases | Not applicable | – | – | – | Classified as "solid" according to GHS definition: commercial 1,1'-dimethyl-4,4'-bipyridinium=diiodide and 1,1'-dimethyl-4,4'-bipyridinium=dimethylsulfate (WHO, 1991) |
| 5 | Gases under pressure | Not applicable | – | – | – | Classified as "solid" according to GHS definition: commercial 1,1'-dimethyl-4,4'-bipyridinium=diiodide and 1,1'-dimethyl-4,4'-bipyridinium=dimethylsulfate (WHO, 1991) |
| 6 | Flammable liquids | Not applicable | – | – | – | Classified as "solid" according to GHS definition: commercial 1,1'-dimethyl-4,4'-bipyridinium=diiodide and 1,1'-dimethyl-4,4'-bipyridinium=dimethylsulfate (WHO, 1991) |
| 7 | Flammable solids | Not classified | – | – | – | Classified into Division 6.1 (UN#2781, bipyridinium pesticide, solid, toxic) (UN Recommendations on the Transport of Dangerous Goods) |
| 8 | Self-reactive substances and mixtures | Not applicable (diiodide), Not classified (dimethylsulfate) | – | – | – | Containing no chemical groups with explosive or self-reactive properties: commercial 1,1'-dimethyl-4,4'-bipyridinium=diiodide.<br>Not classified due to lack of data, though containing chemical groups (sulfonyl) with self-reactive properties: 1,1'-dimethyl-4,4'-bipyridinium=dimethylsulfate. Classified into Division 6.1 (UN#2781, bipyridinium pesticide, solid, toxic) (UN Recommendations on the Transport of Dangerous Goods) |
| 9 | Pyrophoric liquids | Not applicable | – | – | – | Classified as "solid" according to GHS definition: commercial 1,1'-dimethyl-4,4'-bipyridinium=diiodide and 1,1'-dimethyl-4,4'-bipyridinium=dimethylsulfate (WHO, 1991) |
| 10 | Pyrophoric solids | Not classified | – | – | – | Classified into Division 6.1 (UN#2781, bipyridinium pesticide, solid, toxic) (UN Recommendations on the Transport of Dangerous Goods) |
| 11 | Self-heating substances and mixtures | Not classified | – | – | – | Classified into Division 6.1 (UN#2781, bipyridinium pesticide, solid, toxic) (UN Recommendations on the Transport of Dangerous Goods) |
| 12 | Substances and mixtures, which in contact with water, emit flammable gases | Not applicable | – | – | – | Containing no metals or metalloids (B, Si, P, Ge, As, Se, Sn, Sb, Te, Bi, Po, At): commercial 1,1'-dimethyl-4,4'-bipyridinium=diiodide and 1,1'-dimethyl-4,4'-bipyridinium=dimethylsulfate (WHO, 1991) |
| 13 | Oxidizing liquids | Not applicable | – | – | – | Classified as "solid" according to GHS definition: commercial 1,1'-dimethyl-4,4'-bipyridinium=diiodide and 1,1'-dimethyl-4,4'-bipyridinium=dimethylsulfate (WHO, 1991) |
| 14 | Oxidizing solids | Not applicable (diiodide), Not classified (dimethylsulfate) | – | – | – | Not applicable (organic compounds containing no oxygen, fluorine and chlorine): commercial 1,1'-dimethyl-4,4'-bipyridinium=diiodide.<br>Not classified due to lack of data, though being organic compounds containing oxygen bound to elements other than carbon and hydrogen: 1,1'-dimethyl-4,4'-bipyridinium=dimethylsulfate. Classified into Division 6.1 (UN#2781, bipyridinium pesticide, solid, toxic) (UN Recommendations on the Transport of Dangerous Goods) |
| 15 | Organic peroxides | Not applicable | – | – | – | Organic compounds containing no "-O-O-" structure: commercial 1,1'-dimethyl-4,4'-bipyridinium=diiodide and 1,1'-dimethyl-4,4'-bipyridinium=dimethylsulfate (WHO, 1991) |
| 16 | Corrosive to metals | Not classified | – | – | – | Classified into Division 6.1 (UN#2781, bipyridinium pesticide, solid, toxic) (UN Recommendations on the Transport of Dangerous Goods) |

### Health Hazards

| Hazard class | | Classification | symbol | signal word | hazard statement | Rational for the classification |
|---|---|---|---|---|---|---|
| 1 | Acute toxicity (oral) | Category 3 | Skull and crossbones | Danger | Toxic if swallowed | Based on the LD50 (oral route) value of 100mg/kg calculated from the testing data of rat LD50 of 200 mg/kg, 100mg/kg, 110mg/kg and 126mg/kg (EHC 39 (1984)).<br>Note: Classified using data on Cl salts |
| 1 | Acute toxicity (dermal) | Category 2 | Skull and crossbones | Danger | Fatal in contact with skin | Based on the LD 50 (dermal route) value of 80mg/kg representing the lower of the two data of LD50 value of 80mg/kg calculated from the rat LD50 of 90mg/kg, 80mg/kg and 350mg/kg (EHC 39 (1984)), and the LD50 of 236mg/kg calculated from the rabbit LD50 of 500mg/kg, 236mg/kg and 240mg/kg (EHC 39 (1984)).<br>Note: Classified using data on Cl salts |
| 1 | Acute toxicity (inhalation: gas) | Not applicable | – | – | – | Due to the fact that the substance is "solid" according to the GHS definition and inhalation of its gas is not expected. |
| 1 | Acute toxicity (inhalation: | Classification not possible | – | – | – | No data available |

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | Acute toxicity (inhalation: dust, mist) | Category 1 | Skull and crossbones | Danger | Fatal if swallowed | Based on the LD 50 value of 0.005mg/L calculated from the testing data of rat LC50 (6-hour inhalation of dust) of 0.001mg/L, 0.01mg/L, 0.01mg/L and 0.006mg/L (EHC 39 (1984)).<br>Note: Classified using data on Cl salts |
| 2 | Skin corrosion / irritation | Category 1A-1C | Corrosion | Danger | Causes severe skin burns and eye damage | Based on the description in the report on rat skin irritation tests (EHC 39 (1984)): "The substance induced dermatitis associated with erythema, edema, desquamation and necrosis." The substance is classified into Category 1A-1C given the absence of data on severity of corrosion, but should be placed in 1A, if further subclassification is needed. |
| 3 | Serious eye damage / eye irritation | Category 1 | Corrosion | Danger | Causes serious eye damage | Based on the description in the report on rabbit eye irritation tests (EHC 39 (1984)): "Concentrations of 62.5 and 125 g/L caused severe conjunctival reactions," suggesting the substance is a "severe eye irritant." The substance is classified as Category 1 or 2A in the absence of data on reversibility, but should be placed in Category 1, if further subclassification is needed.<br>Note: Classified using data on Cl salts |
| 4 | Respiratory/skin sensitization | Respiratory sensitization: Classification not possible<br>Skin sensitization: not classified | (Respiratory sensitization) -<br>(Skin sensitization) - | (Respiratory sensitization) -<br>(Skin sensitization) | (Respiratory sensitization) -<br>(Skin sensitization) - | Respiratory sensitization: No data available<br>Skin sensitization: Based on the description in the report on guinea pig sensitization tests (EHC 39 (1984)): "No skin sensitization is observed." |
| 5 | Germ cell mutagenicity | Not classified | - | - | - | Based on negative data on multi-generation mutagenicity tests and the absence of data on germ/somatic cell mutagenicity tests in vivo, described in EHC 39 (1984). |
| 6 | Carcinogenicity | Classification not possible | - | - | - | Classification not possible based on expert judgment, given the absence of existing classification. |
| 7 | Toxic to reproduction | Category 2 | Health hazard | Warning | Suspected of damaging fertility or the unborn child | Based on the evidence of reduced pup viability (though no data are available on parental toxicity), described in EHC 39 (1984) and ACGIH (7th, 2001). |
| 8 | Specific target organs/systemic toxicity following single exposure | Category 1 (kidneys, liver, respiratory organs, cardiovascular system, central nervous system) | Health hazard | Danger | Causes damage to organs (kidneys, liver, respiratory organs, cardiovascular system, central nervous system) | Based on the human evidence including "major organ damage: kidney and lung," "toxic myocarditis induced following ingestion of paraquat," "hemorrhagic leukoencephalopathy in the whole central nervous system," and "fibrosis of pneumonitis/alveolar hemorrhagy, and renal tubular degeneration" (EHC 39 (1984)). |
| 9 | Specific target organs/systemic toxicity following repeated exposure | Category 1 (respiratory organs, liver, kidneys, blood system) | Health hazard | Danger | Causes damage to organs through prolonged or repeated exposure (respiratory organs, liver, kidneys, blood system) | Based on the evidence from animal studies including "alveolar edema," "distal renal tubular vacuolation and proximal renal tubular necrosis, hepatic centrolobular necrosis associated with proliferation of Kupffer cells and dilatation of bile ducts, and hemolytic anemia" (EHC 39 (1984)). The effects on experimental animals were observed at dosing levels within the guidance value ranges for Category 1. |
| 10 | Aspiration hazard | Classification not possible | - | - | - | No data available |

## Environmental Hazards

| Hazard class | Classification | symbol | signal word | hazard statement | Rational for the classification |
|---|---|---|---|---|---|
| 11 | Hazardous to the aquatic environment (acute) | Category 1 | Environment | Warning | Very toxic to aquatic life | It was classified into Category 1 from 96 hours EbC50=0.075mg/L of the algae (Selenastrum) (IUCLID, 2000). |
| 11 | Hazardous to the aquatic environment (chronic) | Category 1 | Environment | Warning | Very toxic to aquatic life with long lasting effects | Although acute toxicity is Category 1 and bio-accumulation is low (log Kow=-4.22(PHYSPROP Database, 2005)), since there was no rapidly degrading (BIOWIN), it was classified into Category 1. |