Champion Distribution Ltd
Princes Risborough, Buckinghamshire.
HP29 9LE
Tel: +44 (0) 1844 344 988
Fax: + 44 (0) 1844 344 915
Email: office@championdistribution.co.uk
Emergency Contact: During Office Hours: + 44 (0) 1844 344 988 Out Of Hours: 07967 690 464

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HEALTH & SAFETY INFORMATION

1. *IDENTIFICATION*

FIXAPLUS XF2 FIXER Product Code 120202 / 120204

Concentrated photographic fixers designed for rapid processing X-ray machines. Each case of Fixaplus XF2 makes 2x20 litres of working strength solution on diluting with water.

Fixaplus XF2 comprises two different solutions – Parts A and B – packed together in plastic bottles in a cardboard box, each in duplicate.

Part A	2x5 litres
Part B	2x1 litre

The Packing Code is 4G.

2. *HAZARDS*

Contact with the eyes or skin may cause irritation because of the acidic nature of the solutions. They are also mildly toxic by ingestion. Sulphur dioxide and acetic acid fumes are emitted slowly from the solutions, and inhalation may irritate the upper respiratory tract. A person suffering from asthma may be affected by sulphur dioxide at concentrations as low as 200ppb.

The solutions are water based and contain no major environmental pollutants.

3. *COMPOSITION*

Major components are as follows. These include those defined as hazardous to health in the Control of Substances Hazardous to Health Regulations, i.e. appear in the Chemicals (Hazard Information & Packaging) (CHIP) Regulations &/or which have a maximum exposure limit or occupational exposure standard in the Health & Safety Executive document EH40. These regulations are themselves based on EC Directives of which 88/379/EEC, 67/548/EEC & 91/325/EEC are particularly relevant.

Component	**CAS no.**	**%w/w**	**Symbol**	**Risk Phrases**
Part A				
Water		30		
Ammonium thiosulphate	7783-18-8	<50		
Acetic acid	64-19-7	<2		
Sodium sulphite	7757-83-7	<3		
Part B				

Water		60		
Sulphuric acid	7664-93-9	<10	**Xi**	**36/38**
Aluminium sulphate	10043-01-3	<20	**Xi**	**41**

Working strength

Water		80
Ammonium thiosulphate	7783-18-8	<15
Sulphuric acid	7664-93-9	<2
Aluminium sulphate	10043-01-3	<2

4. *FIRST AID*

Eye Contact: Irrigate the eyes with water for 15 minutes. Ensure all traces are washed out. Seek medical advice.

Skin Contact: Wash affected areas with soap and water as soon as possible. If irritation persists seek medical advice.

Ingestion: If conscious, give water to drink and seek medical advice. Do not induce vomiting.

Inhalation: Remove the person to fresh air.

5. *FIRE-FIGHTING*

The solutions are water-based and non-combustible. There is no explosion hazard.

6. *ACCIDENTAL RELEASE*

Personal: Prevent skin and eye contact. Use respiratory and other protection as Section 8.

Environmental: In emergency, concentrate or working solution can be safely disposed to foul sewer by dilution with water (see Section 12).

Cleaning: Excess liquid should be absorbed with sawdust, sand or proprietary methods. Dispose of this material via incinerator or waste contractor.

7. *HANDLING & STORAGE*

Good general ventilation of ten or more room volume changes per hour in the work area is recommended. Storage should be at moderate temperature i.e., 5-20^{o}C. Keep away from strong acids and alkalis.

8. *PERSONAL PROTECTION*

In the event of spillage, or when working in close proximity to the solutions (e.g. processor maintenance and cleaning), wear protective clothing. This should comprise an overall, rubber gloves, safety goggles to BS2092C and a half-mask respirator fitted with an ABEK1 filter which protects against all fumes likely to be encountered in processing areas including acid gases (such as acetic acid and sulphur dioxide), and ammonia (which may be released if developer and fixer mix).

9. *PHYSICAL & CHEMICAL PROPERTIES*

	Part A	**Part B**	**Working solution**
Appearance	colourless	colourless	colourless
Odour	slight	slight	slight
pH	5.1	0.3	4.3
Boiling point	>100^{o}C	>100^{o}C	>100^{o}C
Melting point	<0^{o}C	<0^{o}C	<0^{o}C
Flash point	none	none	none
Explosive properties	none	none	none
Oxidising properties	none	none	none

Vapour pressure	not determined		
Specific gravity	1.3	1.2	1.1
Water solubility	complete	complete	complete
Octanol/water partition	not determined		

10. *STABILITY & REACTIVITY*

The solutions are stable and will not polymerise. They are predominantly water.

With strong alkalis, ammonia will be liberated from Part A and the working solution. With strong acids these solutions will liberate sulphur dioxide; both are pungent, toxic gases. Part B reacts vigorously with strong alkalis to liberate heat. Thermal decomposition will yield nitrogen, carbon dioxide and inorganic particulates.

11. *TOXICOLOGICAL*

The table summarises data for the hazardous components identified in Section 2. Sulphur dioxide is emitted by the solution and so is included in the table, as is ammonia because this will be liberated if the solution accidentally mixes with developer.

	Oral-rat LD_{50}	**Workplace Exposure Limit ***
Ammonium thiosulphate	2890mg/kg	-
Sulphuric acid	2140mg/kg	1mg/m^3
Sulphur dioxide	2520ppm/ph (LC_{50})	As low as is practicable
Ammonia	350mg/kg	25ppmv
Aluminium sulphate	-	2mg/m^3 (as aluminium)

mg – milligram
kg – kilogram
m^3 – cubic metre
* the lowest applicable (usually long-term)
ppmv – parts per million by volume
LD_{50} – calculated dose to kill 50% of a population of rats when taken in food or drink
LC_{50} – calculated airborne concentration to kill 50% of a population of rats.

Sulphur dioxide will irritate the mucous membranes and upper respiratory tract, and can affect asthmatics at concentrations as low as 200ppb. Notice of the withdrawal of the OES for sulphur dioxide was published in the 2003 Supplement to the Occupational Exposure Limits and the HSE issued a 'Chemical Hazard Alert Notice' (CHAN). With the introduction of the 'Workplace Exposure Limit (WEL) in 2005 the classification for sulphur dioxide is unassigned which places a duty of care on the employer to reduce the exposure to as low as is reasonably practicable.
Sulphuric acid may cause skin and eye irritation.
Ammonia is an eye and mucous membrane irritant with systemic effects through inhalation.

12. *ECOLOGICAL*

Background

Freshwater ecotoxicity is assessed from the effects of the substance on fish (typically rainbow trout for cold water and bluegill sunfish for warm), invertebrates (Daphnia or waterflea) and algae (especially Selenastrum capricornutum). The effects are expressed as 96hrLC_{50}, 48hrEC_{50} and 72hrIC_{50} values respectively (L=lethal, E=effect, I=inhibition – referring to C=concentration at which there is 50% inhibition of growth or 50% of the organisms are affected or dead after the specified interval). Units are usually milligrams per litre and any value of 100mg/l or less indicates a toxic substance.

Toxic effects are lessened if the substance degrades rapidly. Biodegradability is considered rapid if the ratio BOD_5/COD is >0.5. (BOD_5 is the biological oxygen demand imposed by the substance on natural water as it degrades over 5 days. COD is the chemical oxygen demand during complete laboratory oxidisation with dichromate. High BOD or COD means a polluting substance likely to kill organisms by depleting oxygen.) Rapid degradation is also assumed if 70% of dissolved organic carbon (DOC) disappears, or if 60% of the theoretical maximum oxygen depletion (OD) or

carbon dioxide generation (COG) is achieved, over a 28 day period. Abiotic degradation is also possible, e.g. photolysis.

Toxic effects are accentuated if organisms accumulate the contaminant through either the food chain or absorption from ambient media like water. Bioaccumulation potential is related to the partition of the substance between water and lipids. A useful indicator is the octanol/water partition coefficient expressed as its logarithm (logPow). If logPow ⍰3.0 the substance is considered bioaccumulative unless the measured bioconcentration factor (BCF) is ⍰100. (The BCF is the ratio of the concentration inside the organism compared to that in the ambient environment).

Data

The table summarises information for constituents with ecotoxicities ⍰100mg/l:

		Environmental Pollutant
		Silver ion
toxicity (mg/l)	- LC_{50} (fish)	4.⍰⍰g/l
	- EC_{50} (Daphnia)	0.6⍰g/l
	- IC_{50} (algae)	9.3⍰g/l
	- interpretation	very toxic
degradability	- BOD_5/COD	does not degrade
	- DOC	n/a
	- OD/COG	n/a
	- abiotic	does not degrade
	- interpretation	persists
bioaccumulation	- logPow	neg.
	- BCF	no data
	- interpretation	absent

The theoretical oxygen demand of the working strength fixer is **92,000mg/litre**, (the Part A concentrate is 350,000 and Part B 85,000).

Comment

Silver is not present in the fresh solution but dissolves from the film during processing. The free silver ion Ag^+ is extremely toxic (LC_{50} values etc are *micrograms* per litre) but is hardly present in photo effluent because interaction with other ions complexes it or makes it relatively insoluble. The silver thiosulphate complex in fixers, for example, is 15,000 times less toxic than Ag^+. In the environment most silver is precipitated and cannot bioaccumulate. Sewage works remove about 95% of the small amount of metal remaining after in-house silver recovery.
Sulphuric acid is not environmentally dangerous. It appears toxic from tables but this is derived from its pH effect rather than inherent toxicity. This effect is swamped in the environment by dilution and natural buffering.

13.*DISPOSAL*

Spent fixer will contain silver and should therefore be disposed of via waste contractor or treated to remove the silver before release to foul sewer. Unused concentrates and spent working strength fixer are classified as Special Waste when removed by contractor. Empty bottles should be rinsed for safety and to facilitate recycling.
Concentrates and unused fixer should be acceptable for direct discharge to sewer provided they are diluted to meet trade effluent consent limits.
Incineration is not energy efficient as the solutions are largely water, but otherwise is a satisfactory method for disposal.

14.*TRANSPORT*

Not Regulated under current ADR Regulation for transport by road.

15. *REGULATORY INFORMATION*

Labelling is in accordance with the Code of Practice for Classification, Packaging and Labelling of Photographic and Lithographic Processing Chemicals (European Photochemical Industry, Sector Group of CEFIC) which complies with but extends the regulations listed in Section 2 above.

Risk **Safety**

Solution	Symbol	Dangerous Substance	Phrases	Phrases
Part B	Xi	*Sulphuric acid*	36/38	
	Xi	*Aluminium sulphate*	41	26-39

16. *OTHER INFORMATION*

Relevant risk and safety phrases are as follows:

Risk –	**36/38**	Irritating to eyes and skin.
Risk -	**41**	Risk of serious damage to eyes.

The symbol Xi means irritant.

Changes this Revision
Contact Details Updated