

# CONTENTS

## ENVIRONMENTAL HEALTH CRITERIA FOR XYLENES

Preamble	viii
1. SUMMARY	1
2. IDENTITY, PROPERTIES AND ANALYTICAL METHODS	3
2.1 Identity	3
2.2 Physical and chemical properties	4
2.3 Conversion factors	5
2.4 Analytical methods	5
2.4.1 In air	5
2.4.2 In water	6
2.4.3 In biological media	7
2.4.3.1 In blood	7
2.4.3.2 In urine	7
2.4.3.3 In exhaled air	8
2.4.3.4 In human milk	8
3. SOURCES OF HUMAN AND ENVIRONMENTAL EXPOSURE	9
3.1 Production processes	9
3.2 Production levels	9
3.3 Uses	10
4. ENVIRONMENTAL TRANSPORT, DISTRIBUTION AND TRANSFORMATION	11
4.1 Transport and distribution between media	11
4.1.1 Volatilization	11
4.1.2 Rain-out	11
4.1.3 Adsorption	12
4.2 Transformation	12
4.2.1 Biodegradation	12
4.2.1.1 Aerobic degradation	12
4.2.1.2 Anaerobic degradation	15
4.2.2 Abiotic degradation	17
4.2.2.1 Photolysis	17
4.2.2.2 Atmospheric oxidation	18
4.2.2.3 Hydrolysis	19
4.2.3 Bioaccumulation	20

<b>5. ENVIRONMENTAL LEVELS AND HUMAN EXPOSURE</b>	<b>21</b>
5.1 Environmental levels	21
5.1.1 Ambient air	21
5.1.2 Water and sediment	24
5.1.2.1 Surface water	24
5.1.2.2 Groundwater	25
5.1.2.3 Precipitation	28
5.1.2.4 Leachate	28
5.1.2.5 Sediment	28
5.1.3 Soil	29
5.1.4 Biota	29
5.2 General population exposure	29
5.2.1 Source of exposure	29
5.2.1.1 Air	29
5.2.1.2 Food	33
5.2.1.3 Drinking-water	33
5.2.1.4 Other source of exposure	34
5.2.2 Xylene levels in human biological samples	34
5.3 Occupational exposure during manufacture, formulation or use	36
<b>6. KINETICS AND METABOLISM IN LABORATORY ANIMALS AND HUMANS</b>	<b>39</b>
6.1 Absorption	39
6.1.1 In humans	39
6.1.2 In laboratory animals	40
6.2 Distribution	41
6.2.1 In humans	41
6.2.2 In laboratory animals	42
6.3 Metabolic transformation	44
6.3.1 In humans	44
6.3.2 In laboratory animals	44
6.4 Elimination and excretion	44
6.4.1 In humans	47
6.4.2 In laboratory animals	48
6.5 Factors affecting toxicokinetics in humans and animals	50
6.6 Biological monitoring	51
<b>7. EFFECTS ON LABORATORY MAMMALS AND <i>IN VITRO</i> TEST SYSTEMS</b>	<b>53</b>
7.1 Single exposure	53

7.1.1	Inhalation studies	53
7.1.1.1	<i>o</i> -Xylene	53
7.1.1.2	<i>m</i> -Xylene	54
7.1.1.3	<i>p</i> -Xylene	56
7.1.1.4	Technical or undefined xylene	57
7.1.2	Other exposure routes	58
7.2	Short-term exposure	60
7.2.1	Inhalation studies	60
7.2.1.1	<i>o</i> -Xylene	60
7.2.1.2	<i>m</i> -Xylene	60
7.2.1.3	<i>p</i> -Xylene	62
7.2.1.4	Technical or undefined xylene	63
7.2.2	Other exposure routes	66
7.3	Long-term exposure	67
7.4	Skin and eye irritation; sensitization	74
7.5	Reproductive and developmental toxicology	75
7.6	Mutagenicity and related end-points	82
7.7	Carcinogenicity	83
7.8	Other effects	84
8.	EFFECTS ON HUMANS	85
8.1	Acute and accidental exposure	85
8.2	Controlled human studies	85
8.3	Occupational exposure	89
9.	EFFECTS ON OTHER ORGANISMS IN THE LABORATORY AND FIELD	92
9.1	Laboratory experiments	92
9.1.1	Microorganisms	92
9.1.2	Aquatic organisms	93
9.1.2.1	Algae	93
9.1.2.2	Higher plants	94
9.1.2.3	Protozoa	94
9.1.2.4	Invertebrates	95
9.1.2.5	Vertebrates	98
9.1.3	Terrestrial organisms	103
10.	EVALUATION OF HUMAN HEALTH RISKS AND EFFECTS ON THE ENVIRONMENT	104
10.1	Evaluation of human health risks	104
10.1.1	Exposures	104
10.1.2	Effects	104
10.1.3	Guidance value	107

10.2	Evaluation of effects on the environment	109
10.2.1	Exposure	109
10.2.2	Effects	109
10.2.3	Risk evaluation	109
11.	CONCLUSIONS	111
12.	RECOMMENDATIONS	112
13.	PREVIOUS EVALUATIONS BY INTERNATIONAL BODIES	113
	REFERENCES	114
	RESUME	144
	RESUMEN	146