

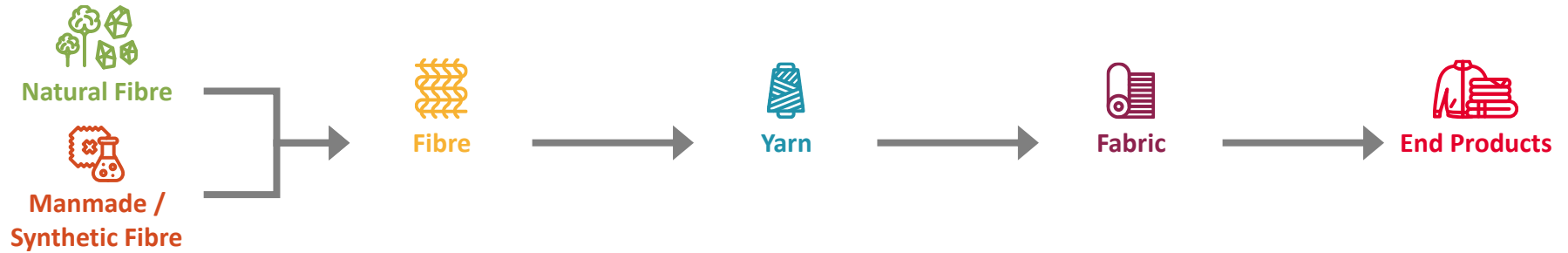


# The True Cost of Colors

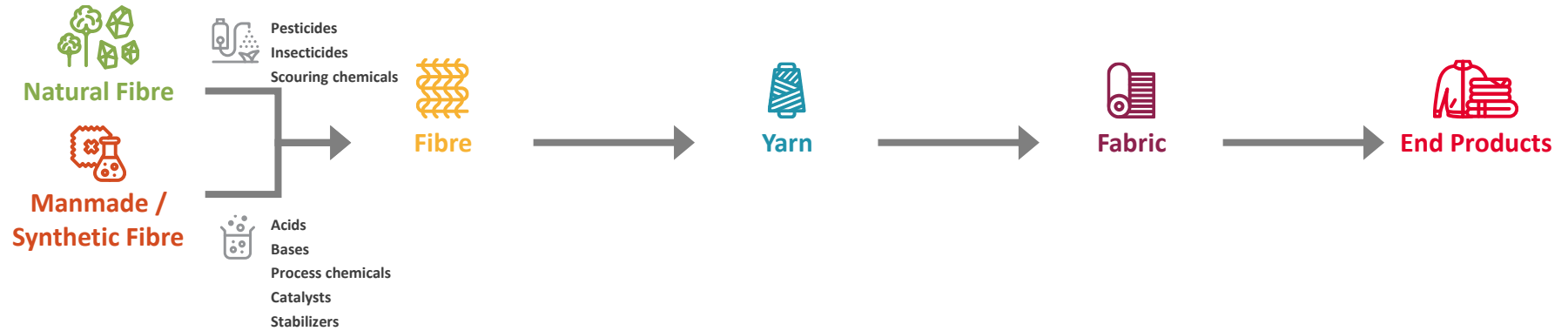
## Chemical Dyestuffs in Textile Industry

Q I M A

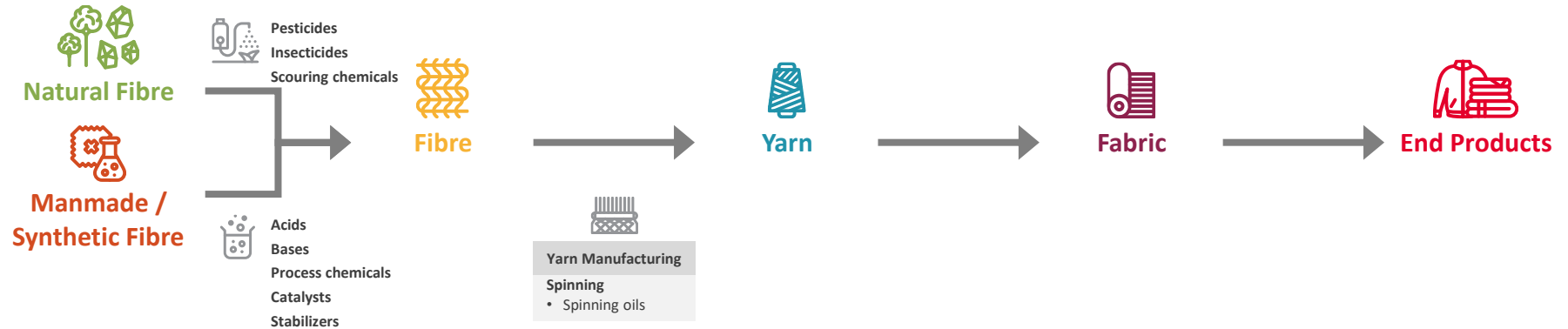
# The Textile Production Process



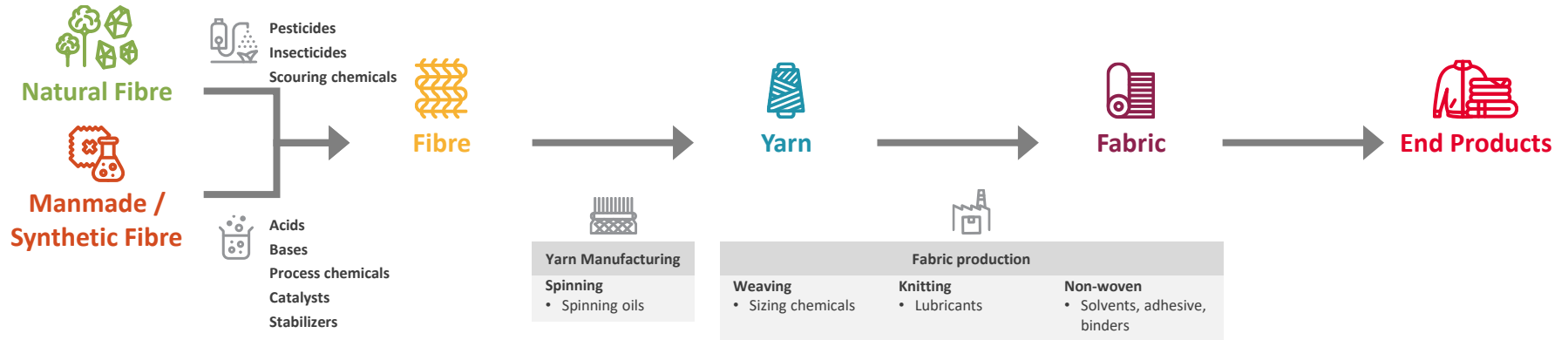
# The Textile Production Process



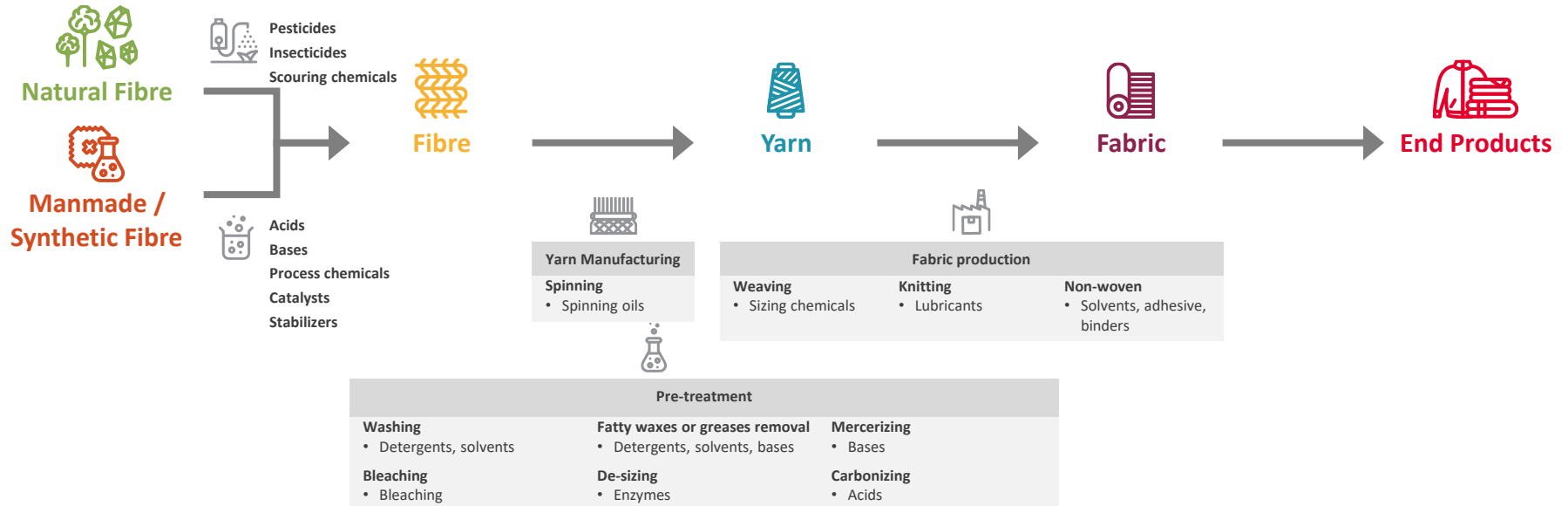
# The Textile Production Process



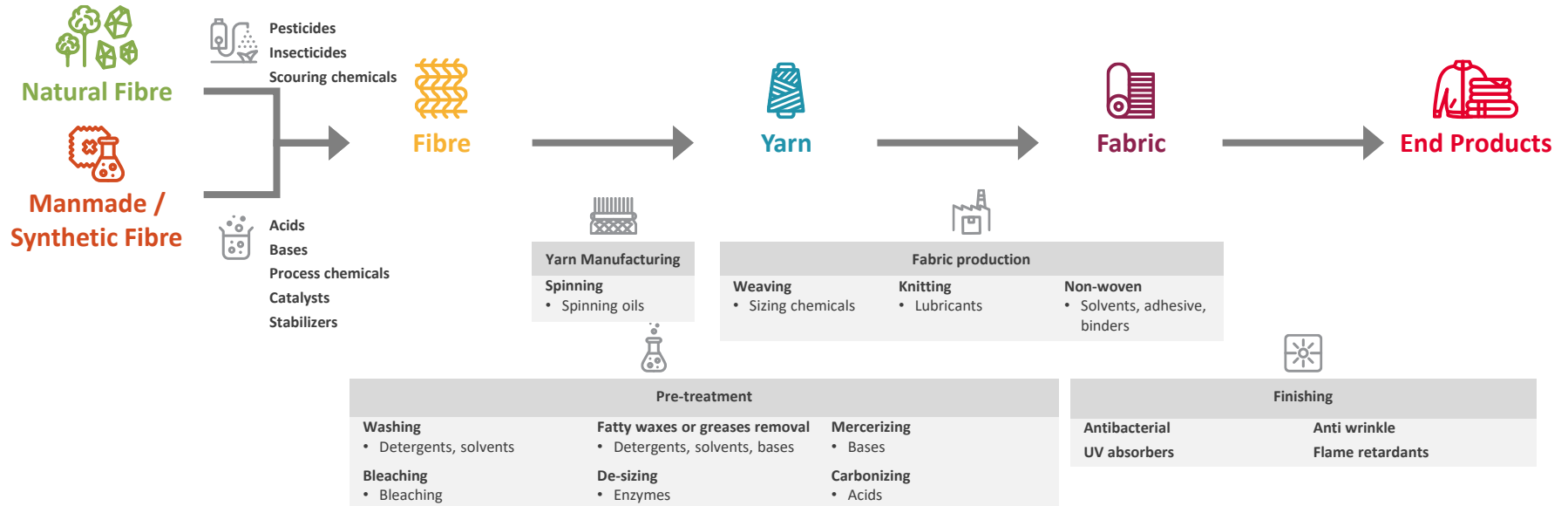
# The Textile Production Process



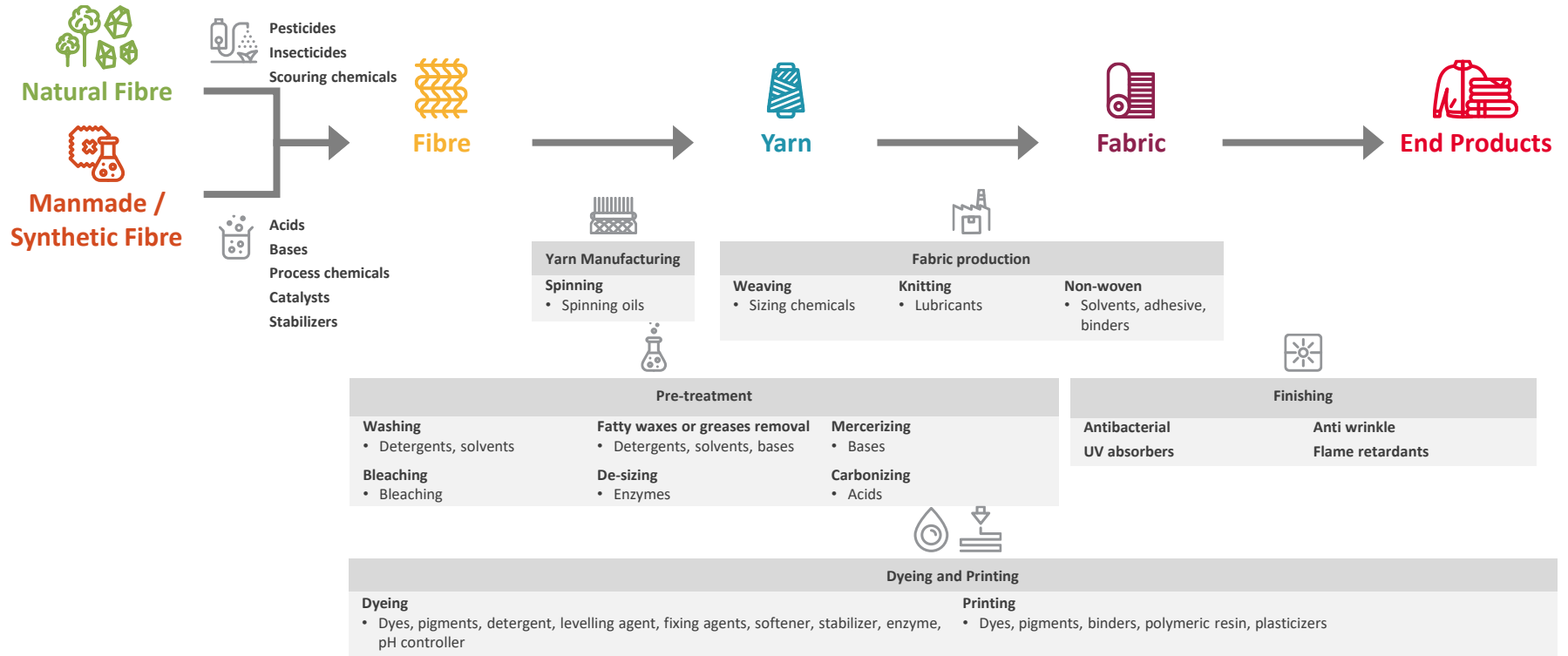
# The Textile Production Process



# The Textile Production Process



# The Textile Production Process





# Dyes Classification

## Natural dyes: dyes substances extracted from natural sources

- Considered as eco-friendly dyes
- Generally poor colorfastness properties and poor reproducibility
- Need eco-dyeing process in order to produce eco friendly garments



# Dyes Classification

**Synthetic dyes: made from coal tar and petroleum**

**Textile dyes can be classified in several ways**

- > solubility
- > chemical constitution
- > dyeing process

**No single class of dye can dye all fibres**



# Chemical Dyestuff

	Wool	Silk	Nylon	Polyester	Acetate	Cotton	Viscose	Acrylic	Leather
<b>Reactive Dyes:</b> dyes react with the cellulosic fiber	x	x	x		x	x	x		
<b>Acid Dyes:</b> water insoluble anionic dyes, applied from an acidic bath	x	x	x						x
<b>Basic Dyes:</b> cationic dyes from coal tar derivatives	x	x						x	
<b>Direct Dyes:</b> applied directly to the fabrics from an aqueous solution	x	x	x			x	x		x
<b>Disperse Dyes:</b> insoluble in water and prepared for dyeing by being grounded into relatively fine powder in the presence of dispersing agents			x	x	x				

ISO EN14362-1:2017

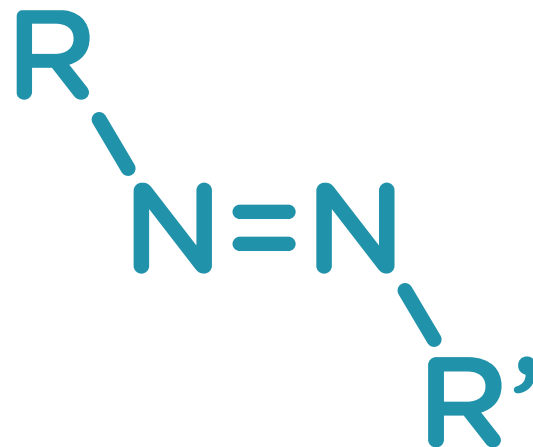
# RSL vs MRSL

	RSL	MRSL
<b>Definition</b>	RSL is a list of hazardous chemicals that are restricted below a certain threshold in finished textile products.	MRSL is a list of hazardous chemicals that are restricted below a certain threshold in textile, apparel and footwear manufacturing. This list includes process chemicals which may be used in manufacturing but may not present in the finished product.
<b>Criteria</b>	Provides threshold limits of hazardous chemicals allowed in finished products.	Provides threshold limits of hazardous chemicals allowed in chemical formulations.
<b>Identification</b>	Products tested for the presence of hazardous chemicals.	Chemical formulations tested in for the presence of hazardous chemicals.
<b>Process permissions</b>	Allows hazardous chemicals in manufacturing.	Do not allow hazardous chemicals to enter the factory gate.
<b>Tool</b>	Mostly adhere to regulatory requirements.	Beyond compliance.
<b>Focus</b>	Focus on end of pipe.	Focus on input chemicals.

# Azo Dyes

## What are azo dyes?

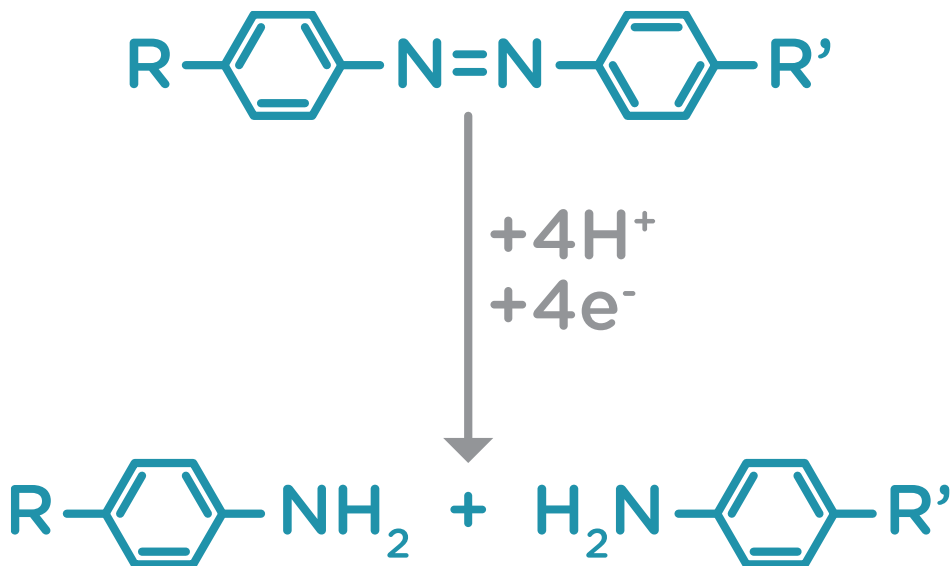
- › A group of synthetic organic dyes that contain the chemical azo group (-N=N-)
- › Major colorants used in many consumer goods including textile, apparel, leather, cosmetics and food
- › Representing over 70% of the dyes used in the industry
- › Able to dye the cloth at a lower temperature
- › Offer a wide range of colors, better colorfastness and higher intensity
- › Used in dyeing of a range of materials including textile, leather, plastics and paper



# Azo Dyes

## Are azo dyes safe?

- > Under specific conditions, some azo dyes undergo reductive cleavage during metabolism to form primary aromatic amines which are carcinogenic – typically bladder, breast and liver cancers\*

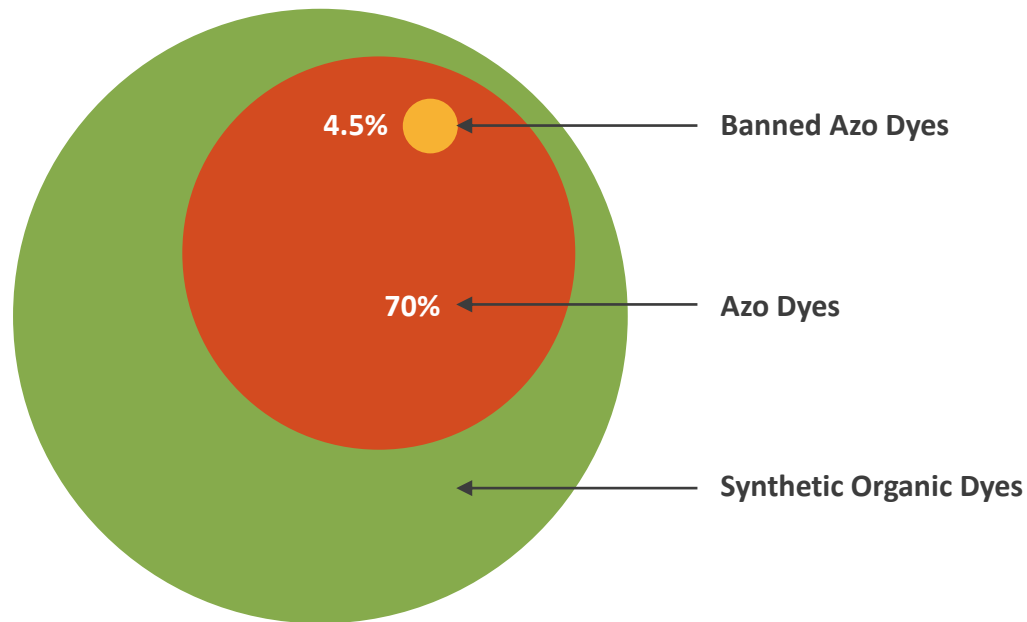


\* Dom N, Knapen D, Benoot D, Nobels I & Blust R (2010). Aquatic multi-species acute toxicity of (chlorinated) anilines: Experimental versus predicted data. Chemosphere 81(2): 177-1

# Azo Dyes

## Are azo dyes safe?

- > **NOT** all azo dyes release banned amines
- > Only those azo dyes, which on reductive cleavage release a specific amine, are banned for usage






# Azo Dyes

	Mandatory Requirements	Method	# amines	Limit	Remark
	REACH Regulation (EC) No. 1907/2006 Annex XVII Entry 43	EN 14362-1 & 3	22	30 mg/kg	
	Regulation (EC) No. 1907/2006 Annex XVII Entry 72	EN ISO 17234-1	4	30 mg/kg	
	The National Standard of the People's Republic of China GB18401-2010	Textiles (China) GB/T 17592-2011 GB/T 23344-2009 (pAAB) confirmation	24	20 mg/kg	
	The National Standard of the People's Republic of China GB20400-2006-Leather and Fur	Leather and fur (China) GB/T 19942-2005	23	30 mg/kg	
	CNS 15290 CNS 15503 (children products) CNS 15331 (bags, cases and trunks) CNS 8634 (leather casual shoes) CNS 10632 (leather shoes)"	Textile: CNS 16113-1 & 3 : 2019 Leather: CNS 15204-1 & 2 : 2019	22	30 mg/kg	15503 : children's products up to 14 years old



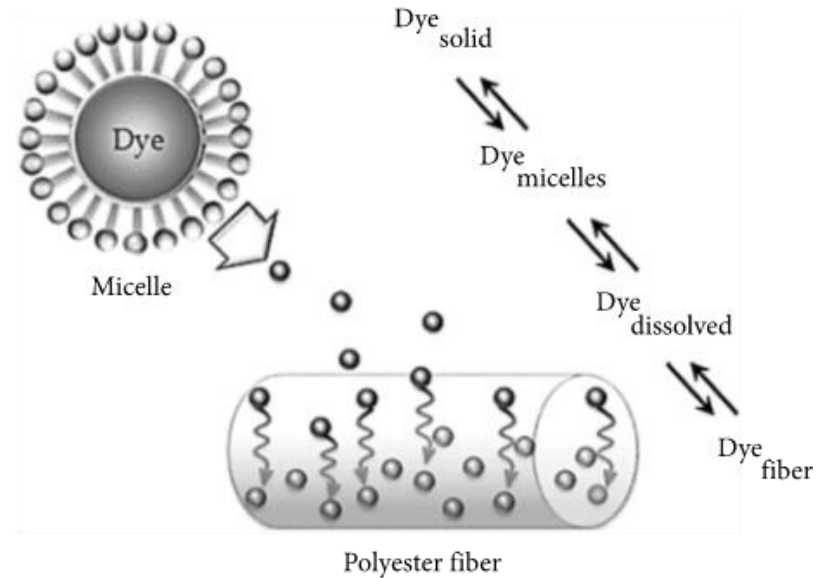
# Azo Dyes

	Mandatory Requirements	Method	# amines	Limit	Remark
	<p>KATS Notification No. 2015-0110, 2017-0018</p> <p>KATS Notification No. 2017-0016 Annex 1</p> <p>KATS Notification No. 2017-0017 Annex 15</p>	EN 14362-1 & 3 / EN ISO 17234.1	24	30 mg/kg	Children textiles up to 13 years
	Vietnam Circular no.21/2017/TT-BCT	<p>TCVN 7619-1:2007 (EN 14362-1:2003)</p> <p>TCVN 7619-2:2007 (EN 14362-2:2003)</p>	24	30 mg/kg	Textile products
	Japan Act No. 112 of October 12, 1973-Textiles-Azo Dye Content	<p>JIS L 1940-1:2014 (ISO 24362-1:2014)</p> <p>JIS L 1940-3:2014 (ISO 24362-3:2014)</p>	24	30 mg/kg	All textile products (including but not limited to diapers, sleepwear, bedding) and leather or fur products (including but not limited to underwear, gloves, outer garments)

No mandatory requirements for US

# Disperse Dyes

- > Sparingly or insoluble in water and they are dispersed into fibres rather than fully dissolved in water to proceed the dyeing process
- > Some chemical substances are used in disperse dye. The dispersing agent is to help improve the depth of shade on the materials
- > Commonly use in the dyeing process of synthetic textiles such as polyester, acetate and polyamide



A. Ketema and A. Worku (2020). "Review on Intermolecular Forces between Dyes used for Polyester Dyeing and Polyester Fiber". J. Chem

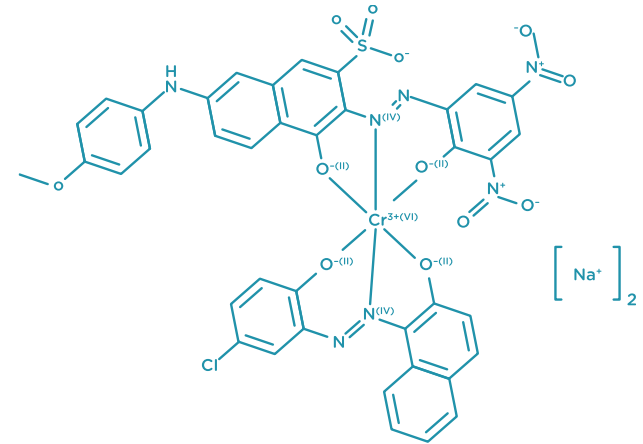
# Disperse Dyes

- > Disperse dye color produce bright and lighter shade and has fair to good colorfastness
- > The restricted disperse dyes are suspected of causing allergic reactions or potentially carcinogenic
- > Some disperse dyes may cleave to form carcinogenic amines
- > Orange 37/76 is the most common failure





# Other Dyes

## Blue Colorant (“Navy Blue”)

- A solvent dye with specific dye mixture
- Component 1 : disodium (6-(4- anisidino)-3-sulfonato-2-(3,5- dinitro-2-oxidophenylazo)-1-naphtholato)(1- (5-chloro-2-oxidophenylazo)- 2-naphtholato)chromate(1-) (CAS # : 118685-33-9)
- Component 2 : Trisodium bis(6-(4-anisidino)-3- sulfonato-2-(3,5-dinitro-2- oxidophenylazo)-1-naphtholato)chromate(1-) (CAS # : not allocated)
- Essentially insoluble in water but soluble in different solvents
- Used to dye leather and natural and synthetic fibres
- Very toxic to aquatic life with long lasting effects and potential to cause allergic skin reaction



# Other Dyes

	Mandatory Requirements	Method	# amines	Limit	Remark
	Regulation (EC) No. 1907/2006-REACH (Entry 72)		5	50 mg/kg	
	Regulation (EC) No. 1907/2006 REACH Annex XVII		Blue colorant	0.1% by weight	Applies to substances and mixtures only
	Germany Food, Feed and Commodities Law §30 (LFGB §30)	DIN 54231:2005	8	Non detected	
	Korea Safety Quality Mark Act (KC Mark)	KS K 0736:2014	22	Non detected	Applicable to baby products, children and innerwear (polyester, nylon, acrylic, acetate, triacetate, vinyl chloride)

No mandatory requirements for US and China

# Precautions

- Explain your requirements with your suppliers
- Request suppliers to submit a confirmation of compliance and/or a test report from a third-party laboratory
- Consider performing risk based random check on the materials
- Monitor the presence of banned dyes in your finished articles
- Have a solid chemical management system in place



# Azo Dyes

## Dyes that can release banned amines

### Acid Dyes

Acid Black 29	Acid Red 116
Acid Black 94	Acid Red 128
Acid Black 131	Acid Red 148
Acid Black 132	Acid Red 150
Acid Black 209	Acid Red 158
Acid Brown 405	Acid Red 167
Acid Orange 24	Acid Red 264
Acid Orange 45	Acid Red 265
Acid Red 4	Acid Red 420
Acid Red 5	Acid Violet 12
Acid Red 24	Acid Violet 49
Acid Red 73	Acid Red 99
Acid Red 85	Acid Orange 56
Acid Red 114	Acid Red 97
Acid Red 115	

### Disperse Dyes

Disperse Orange 159	Disperse Yellow 23
Disperse Red 151	Disperse Yellow 56
Disperse Yellow 7	

### Basic Dyes

Basic Brown 4	Basic Red 111
Basic Red 42	Basic Yellow 103

### Solvent Dyes & Pigments

Solvent Orange 7	Pigment Red 8
Solvent Red 19	Pigment Red 22
Solvent Red 23	Pigment Red 38

### Direct Dyes

Direct Black 4	Direct Brown 2	Direct Red 10
Direct Black 29	Direct Brown 6	Direct Red 13
Direct Black 38	Direct Brown 25	Direct Red 17
Direct Black 91	Direct Brown 27	Direct Red 21
Direct Black 154	Direct Brown 31	Direct Red 22
Direct Blue 1	Direct Brown 33	Direct Red 24
Direct Blue 2	Direct Brown 51	Direct Red 26
Direct Blue 3	Direct Brown 59	Direct Red 28
Direct Blue 6	Direct Brown 79	Direct Red 37
Direct Blue 8	Direct Brown 95	Direct Red 39
Direct Blue 9	Direct Brown 101	Direct Red 44
Direct Blue 10	Direct Brown 154	Direct Red 46
Direct Blue 14	Direct Brown 222	Direct Red 62
Direct Blue 15	Direct Green 1	Direct Red 67
Direct Blue 22	Direct Green 6	Direct Red 72
Direct Blue 25	Direct Green 8	Direct Violet 1
Direct Blue 35	Direct Green 8:1	Direct Violet 12
Direct Blue 53	Direct Green 85	Direct Violet 21
Direct Blue 76	Direct Orange 1	Direct Violet 22
Direct Blue 151	Direct Orange 6	Direct Yellow 1
Direct Blue 160	Direct Orange 7	Direct Yellow 24
Direct Blue 173	Direct Orange 8	Direct Yellow 48
Direct Blue 192	Direct Orange 10	Direct Blue 158
Direct Blue 201	Direct Orange 108	
Direct Blue 215	Direct Red 1	
Direct Blue 295	Direct Red 2	
Direct Brown 1	Direct Red 7	
Direct Brown 1:2		



Thank You!

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