Technical Information

(vol.08)

Nippon Kayaku (Thailand) CO., LTD.
Technical Service Center

「General introduction of Kayacelon React」

- Kayacelon React is the world's first neutral pH high temperature fixation reactive dye developed by Nippon Kayaku.
- Because Kayacelon React does not require alkali pH, it can be conveniently used in one-bath dyeing of blended fabrics with other types of dyes, such as disperse dyes for Polyester/Cotton blends.
- Kayacelon React uses a unique reactive group, Mononicotinic acid-triazine (MNT) reactive group, to achieve the innovative properties mentioned.

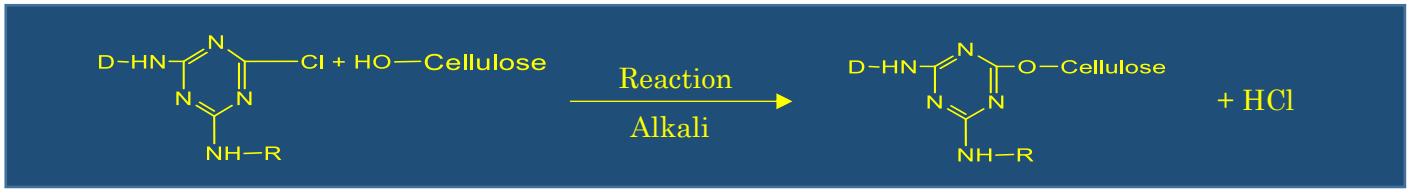
[Trichromatic colors of Kayacelon React]

	Color sample			Light	Perspiration Light		Washing ISO(2: 50℃)		Chlorinated
	0.03%	0.5%	2.0%	ISO	JIS	ATTS	Cotton	Silk	Water
Kayacelon Yellow CN-EX				5	4-5	4-5	4-5	4-5	4-5
Kayacelon Red CN-3B				4	4	2-3	4-5	4-5	4
Kayacelon Blue CN-MG				4	3-4	2	4-5	4-5	3

(98-130℃, pH 7 Dye) Fastness test: 2.0% Dyeing Fabric

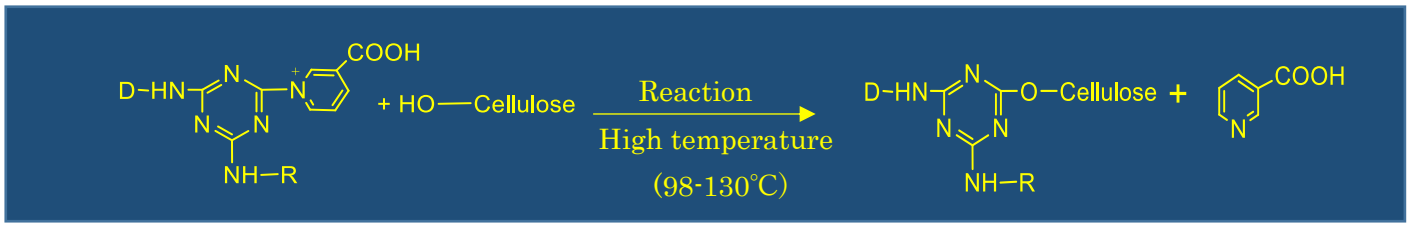
In standard 80℃ reactive dyes such as Monochloro-triazine (MCT) monofunctional reactive dyes, the fixation to cellulose is assisted by the addition of alkali.

≪MCT reactive group≫



In Kayacelon React reactive dyes by Nippon Kayaku, fixation to cellulose does not require the addition of alkali, and fixation to cellulose requires only high temperature.

≪MNT reactive group≫



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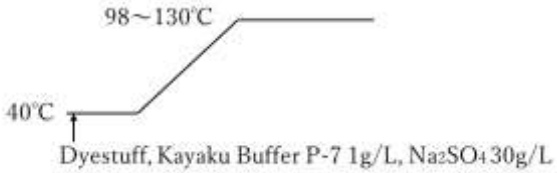
[Dyeing properties of Kayacelon React]

The step-dyeing properties of Kayacelon React trichromatic series are displayed below.



Kayacelon React		70℃	80℃	90℃	98℃	30 min.	60 min.
Y/ CN-EX 1.050 R/ CN-3B 0.235 B/ CN-MG 0.400	Absorption						
	Reaction						

Kayacelon React		70℃	80℃	90℃	100℃	110℃	120℃	130℃	20 min.
Y/ CN-EX 1.050 R/ CN-3B 0.235 B/ CN-MG 0.400	Absorption								
	Reaction								

The liquor ratio dependency of Kayacelon React trichromatic series are displayed below.

Liquor ratio		Temperature		Glauber's salt [Na_2SO_4]	
12:1	30:1	100℃	130℃	24 g/L	36 g/L

The affinity and reactivity of the trichromatic colors are matched, providing excellent reproducibility in dyeing mixed shades such as brown and grey.

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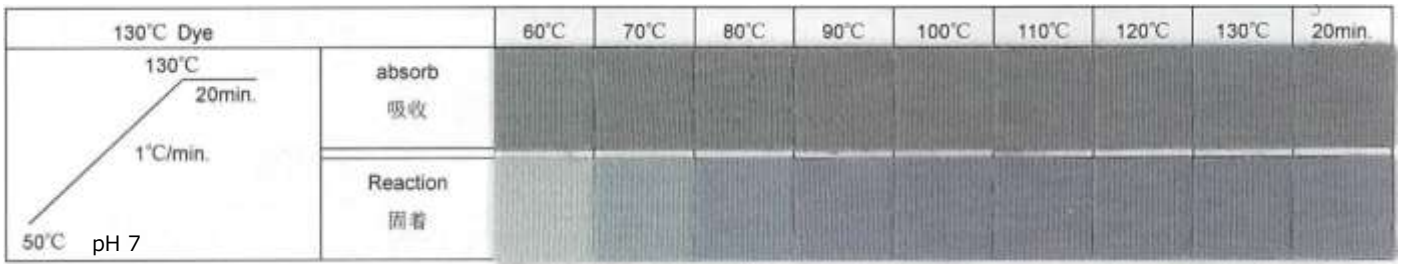
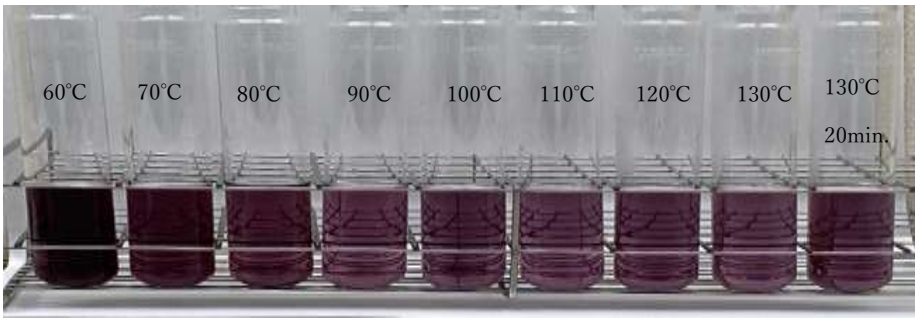
[Relationship between leveling and temperature]

The data below shows the absorption of dyes onto cellulose, and the reaction of dyes on cellulose.

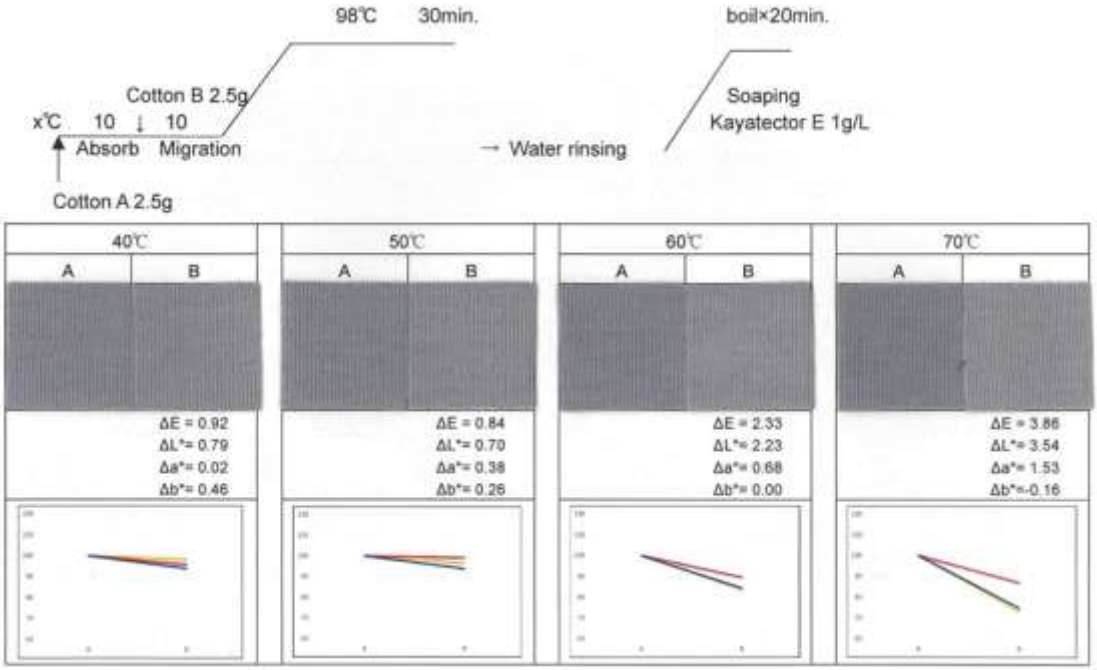
As shown, Kayacelon React's fixation to cellulose initiates at around 80℃ under neutral pH conditions.



Remainder in dyebath



There is a large quantity of unreacted dye at 60℃ and 70℃ remaining in the dyebath, therefore implying that most of the dye transfer from the dyebath to the fabric occurs at a temperature below 80℃.



As shown, it is effective to keep the temperature at 40℃ for about 15 minutes (5 to 6 rotations with a liquid flow dyeing machine) after addition of final Glauber's salt, and then raise the temperature to obtain uniform dyeing of the Kayacelon React dye.

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[Soaping requirements of Kayacelon React]

The wash-off properties of Kayacelon React dyes are inferior to 60℃ reactive dyes, and should be around the same level as KCN-E (MCT type) 80℃ reactive dyes. Therefore, for effective soaping of Kayacelon React dyes, Nippon Kayaku strongly recommends soaping temperature of 95℃ or higher for Kayacelon React dyed fabric.

The data below compares the soaping properties of Kayacelon React trichromatic colors with CF-COMJ 60℃ trichromatic colors.

Water rinsing
(27℃ Pure water)
↓
Liquor ratio 30:1
Kayatector E 1g/L

x℃×20min.→ w.r.

		w.r.	60℃	80℃	90℃	95℃	98℃
KYR	%owf						
Y/CN-EX	0.034						
R/CN-3B	0.016						
B/CN-MG	0.050	ΔE = 1.90 ΔL*=-1.17 Δa*=-0.61 Δb*= 1.37	ΔE = 1.50 ΔL*=-1.09 Δa*=-0.31 Δb*= 0.99	ΔE = 0.65 ΔL*=-0.22 Δa*=-0.20 Δb*= 0.58	ΔE = 0.24 ΔL*= 0.03 Δa*=-0.12 Δb*= 0.21	ΔE = 0.14 ΔL*= 0.05 Δa*=-0.03 Δb*= 0.13	Ref.
KCN	%owf						
Y/CF-COMJ	0.022						
R/CF-COMJ	0.018						
B/CF-COMJ	0.043	ΔE = 1.31 ΔL*=-1.29 Δa*=-0.06 Δb*= 0.20	ΔE = 0.59 ΔL*=-0.51 Δa*=-0.30 Δb*=-0.07	ΔE = 0.48 ΔL*=-0.41 Δa*=-0.08 Δb*=-0.23	ΔE = 0.33 ΔL*=-0.31 Δa*= 0.03 Δb*=-0.11	ΔE = 0.29 ΔL*= 0.14 Δa*=-0.09 Δb*=-0.24	Ref.

Water rinsing
(27℃ Pure water)
↓
Liquor ratio 30:1
Kayatector E 1g/L

x℃×20min.→ w.r.

		w.r.	60℃	80℃	90℃	95℃	98℃
KYR	%owf						
Y/CN-EX	0.170						
R/CN-3B	0.080						
B/CN-MG	0.250	ΔE = 3.88 ΔL*=-3.39 Δa*=-0.45 Δb*= 1.84	ΔE = 1.53 ΔL*=-1.09 Δa*=-0.03 Δb*= 1.08	ΔE = 0.90 ΔL*=-0.79 Δa*= 0.08 Δb*= 0.43	ΔE = 0.67 ΔL*=-0.66 Δa*= 0.09 Δb*= 0.09	ΔE = 0.34 ΔL*=-0.30 Δa*= 0.15 Δb*=-0.07	Ref.
KCN	%owf						
Y/CF-COMJ	0.108						
R/CF-COMJ	0.088						
B/CF-COMJ	0.216	ΔE = 1.61 ΔL*=-1.54 Δa*=-0.13 Δb*= 0.45	ΔE = 0.63 ΔL*=-0.54 Δa*=-0.19 Δb*= 0.26	ΔE = 0.24 ΔL*=-0.21 Δa*=-0.01 Δb*= 0.11	ΔE = 0.13 ΔL*= 0.11 Δa*= 0.06 Δb*= 0.05	ΔE = 0.16 ΔL*= 0.13 Δa*=-0.03 Δb*= 0.08	Ref.

***w.r. = water rinsing**

Compared to the 60℃ reactive dyes, Kayacelon React dyestuff requires higher soaping temperatures for effective washing off and removal of unfixed dyes.

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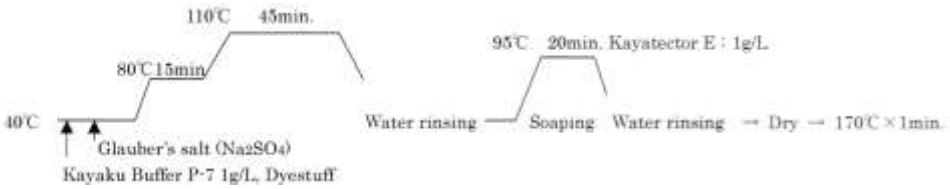
[One bath dyeing: PET/Cotton blends]

The ability for cellulose to be dyed at neutral pH and high temperatures enables Kayacelon React to be used with other types of dyes for one-bath dyeing of cellulosic blends.

An example is shown below where Polyester/Cotton (50/50) blended fabric is dyed with Kayacelon React and Kayalon Microester AQ-LE (Disperse dyes) in one bath at 130℃, 20 min and 110℃, 45 min.



Kayalon Microester AQ-LE Colors + Kayacelon React CN Colors:		①	②	③	④	⑤
One-bath dyeing of Polyester/Cotton blend with Kayacelon React and Kayalon Microester AQ-LE	130℃ × 20min.					
	110℃ × 45min					

For more information regarding one-bath dyeing of Kayacelon React with disperse dyes for Polyester/Cotton blends, please see *Technical Communication Vol. 5* under Blends dyeing.

[Kayacelon React as Topping dye]

As shown, Kayacelon React is a unique reactive dyestuff enabling the dyeing of cellulosic fibers with high temperatures without the addition of alkali. As the dyeing rate is controlled by temperature, it allows for shorter dyeing processes as partitioned and careful addition of alkali is not required. Quite often, due to Kayacelon React's convenient dyeing process, it is also often used as a topping dye for the correction of color after dyeing with regular reactive dyes.

For more details regarding the use of Kayacelon React as a topping dye, please see *Technical Communication Vol. 9*.

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