

A study of new pigment precursor for inkjet applications

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Two general categories;
a dye-based ink
and a pigment-based ink

Table1 Evaluation of printed images

Ink	Light fastness	Gloss	Rubbing resistance
Pigment	excellent	low	poor
Dye	poor	high	good

Demand for color materials combining higher image stability with higher image quality is so high.

Cross-sectional microscopic image of each printing medium

Pigment (particle average size is about 100-150nm) remains on the surface of media mainly.

So the image has poor rubbing resistance, and the roughness of surface of printing media leads low gloss.

If pigment spread inside of printing media, gloss and rubbing resistance are getting better?

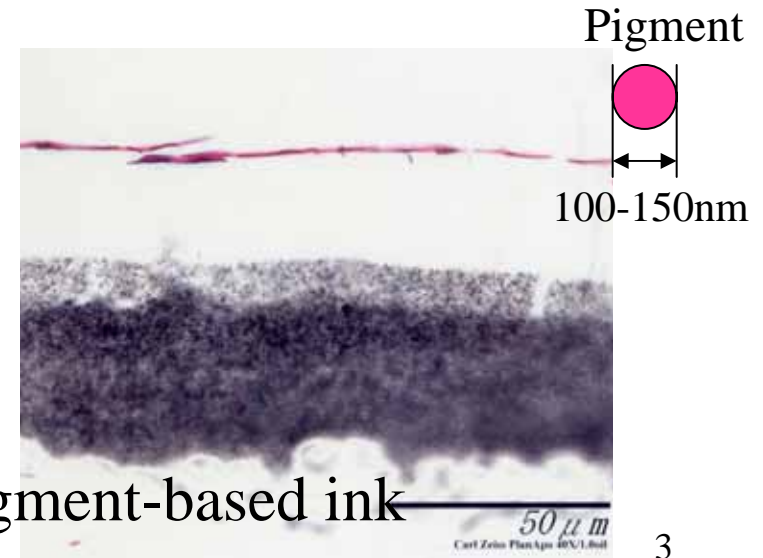
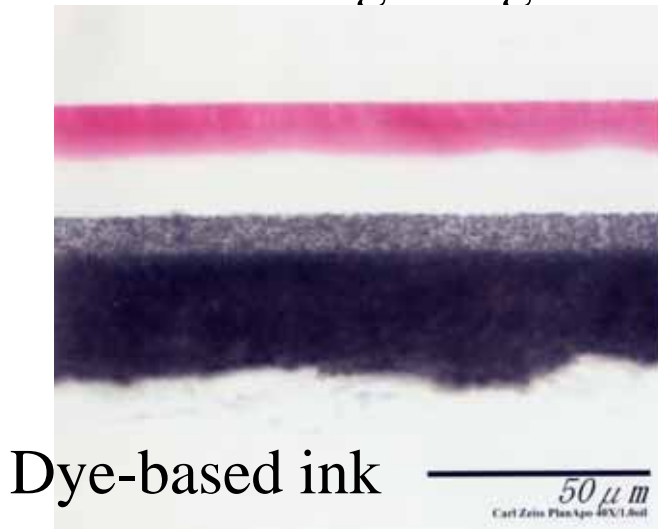


Fig.1

How to have pigment particles penetrate into the inside of printing media?

Experiment

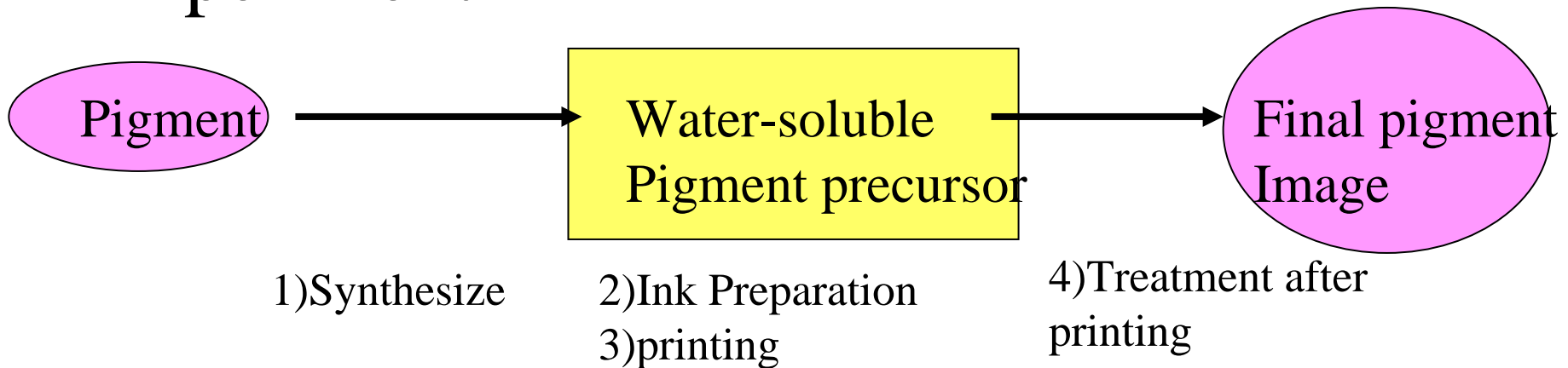
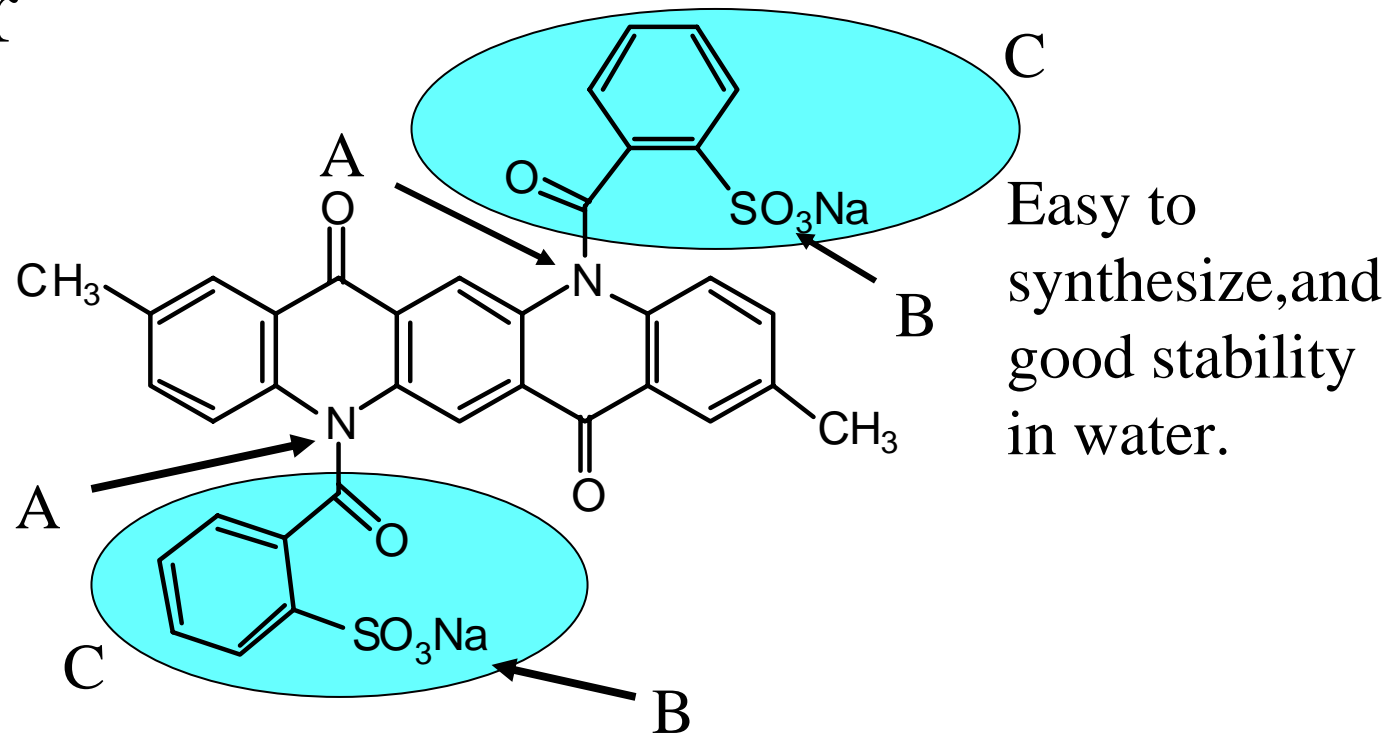


Fig.2

Design of water-soluble pigment precursor

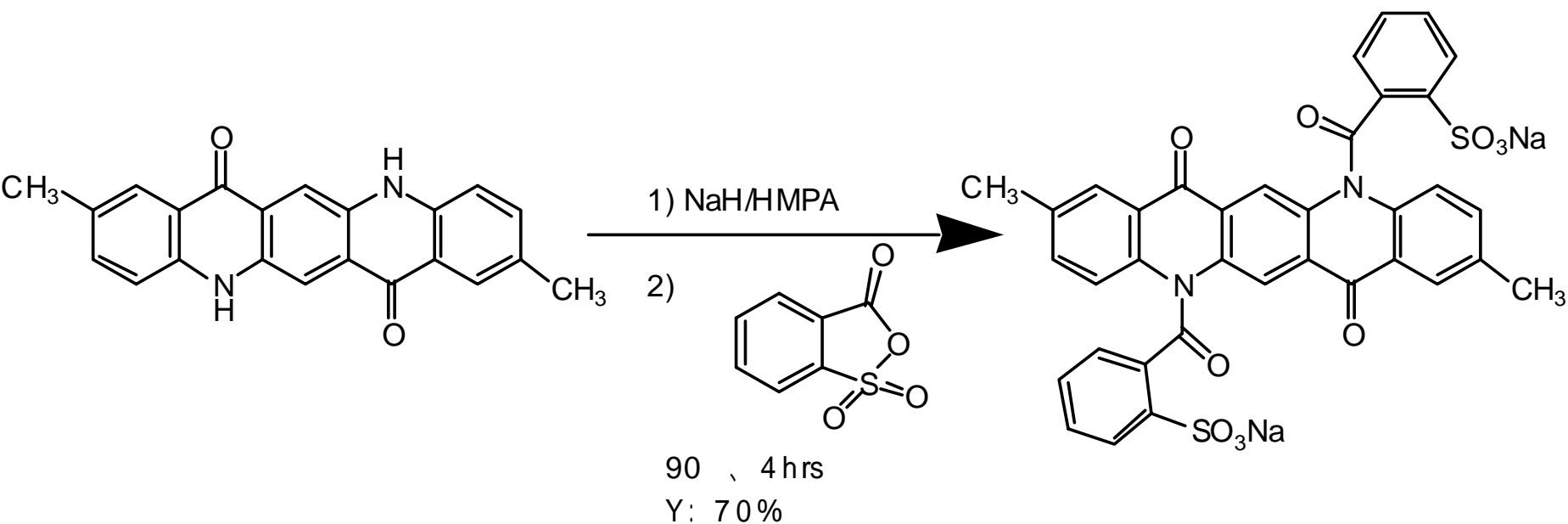


A is protected by C group to increase water solubility, owing to prevent the aggregation of molecules.

B; Water-soluble radical

Fig.3

Synthesize of pigment precursor



Quinacridon Type
CI Pigment Red 122

Pale yellow powder

Fig.4

Stability of pigment precursor

Stability of this precursor in various pH has been studied. In alkali condition, or neutral condition this precursor is stable. Fig 5 shows the stability of the precursor in alkali condition(pH10).

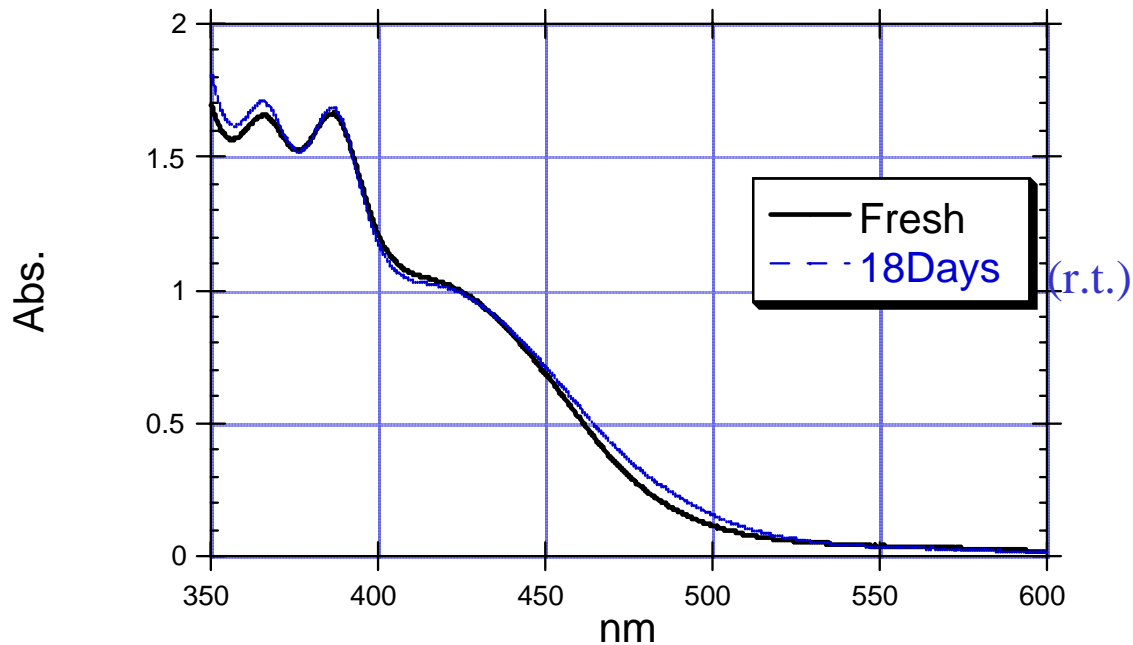


Fig.5

Ink preparation and printing

1) This ink can be prepared easily as dye-based ink.

Ink formulation

Pigment Precursor (6%)

Diethylene Glycol(10%)

Glycerin(10%),

Triethylene Glycol Mono-n-butylEther(10%)

Nonionic surface-active agent(0.1%)

Deionized Water(63.9%)

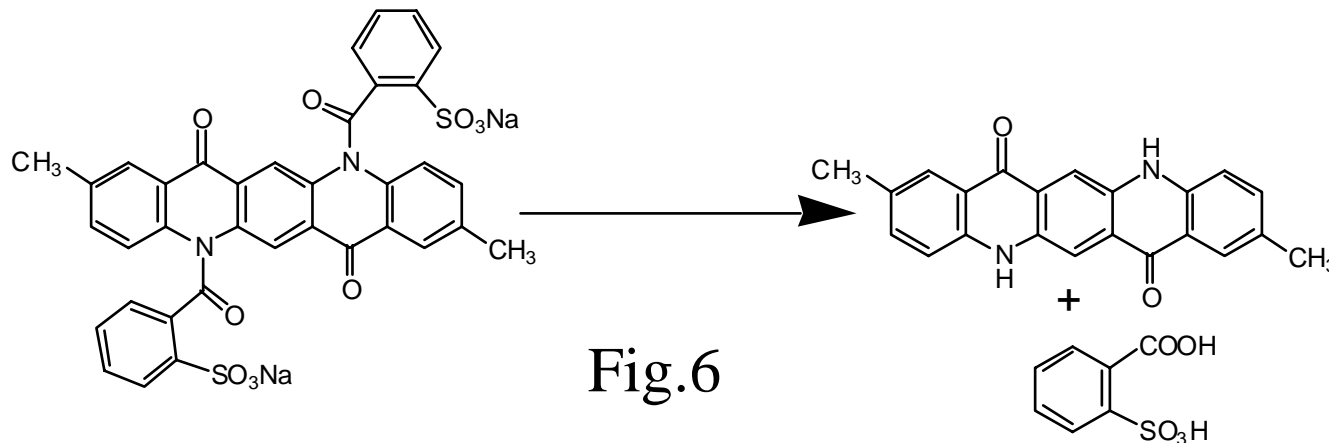
2) Print test

Media :Konica Inkjet Paper Photolike QP

Printer :Epson printer(piezo)

Treatment after printing to change the precursor to stable pigment.

- 1) Reaction Deprotection of the protecting groups
(hydrolysis of the amido bonding)



- 2) Condition Adding the catalyses and heating.

Catalyses: dil.sulfonic acid p-TsOH/water

Heat: 90-130 , a few seconds

(Commercial laminator was used)

Reflection spectra

Two spectra are almost same.

This fact indicates the pigment precursor changed to CI Pig. Red 122

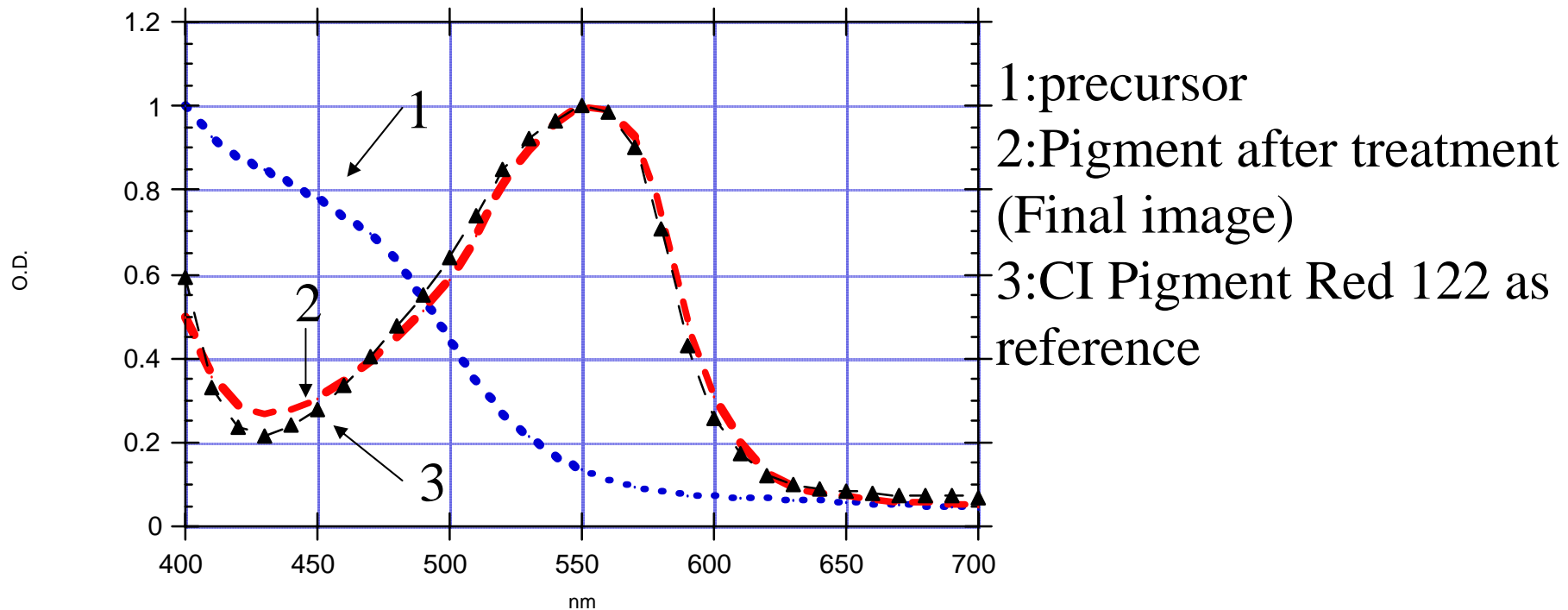


Fig.7

Light fastness

The light fastness has been observed. The level light fastness is between dye-based ink and conventional pigment-based ink

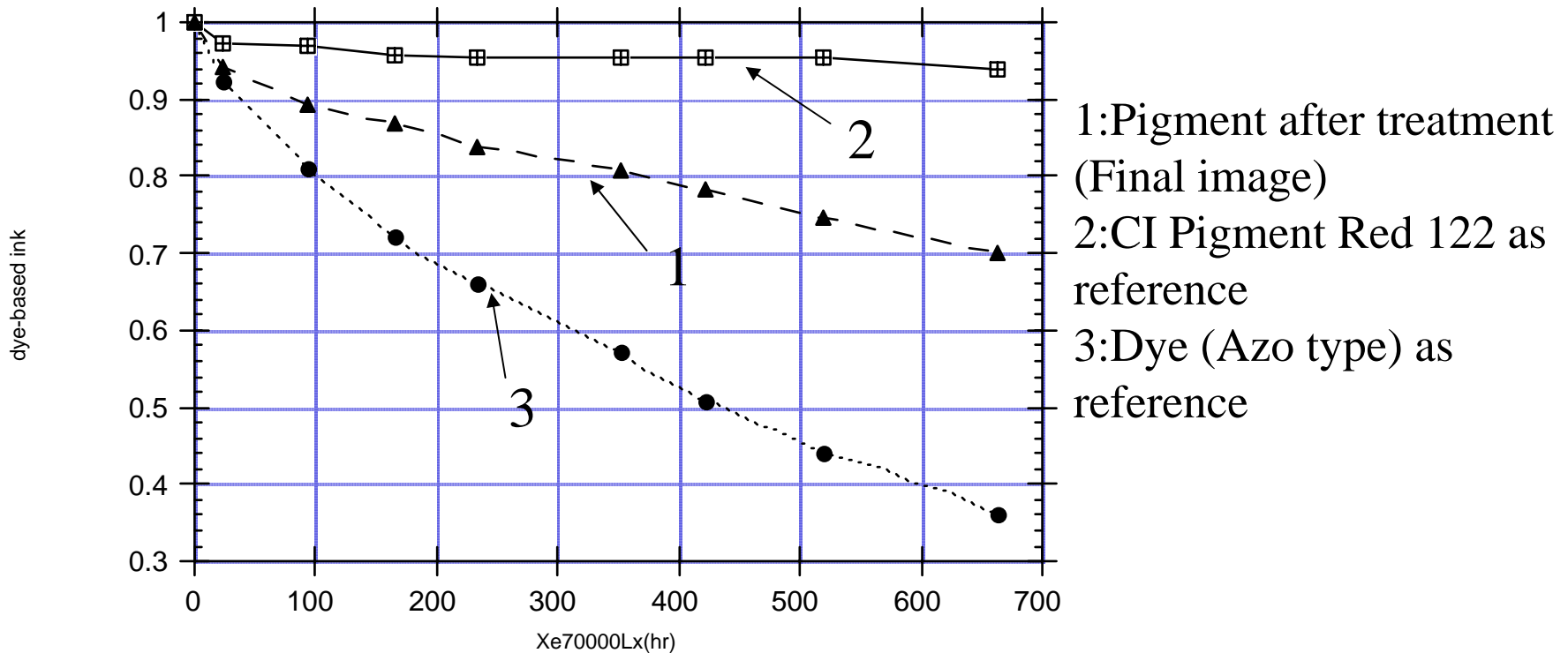


Fig.8

Cross-sectional microscopic images

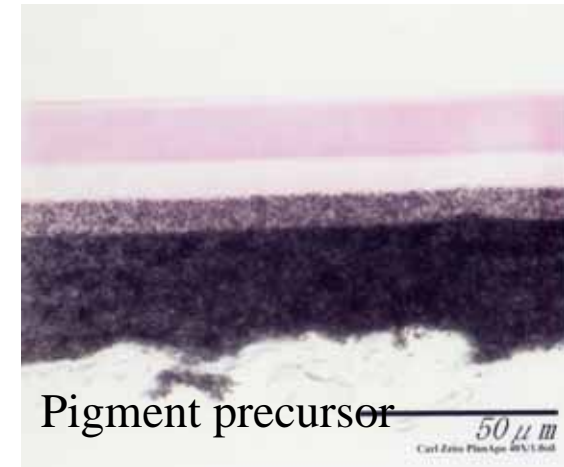
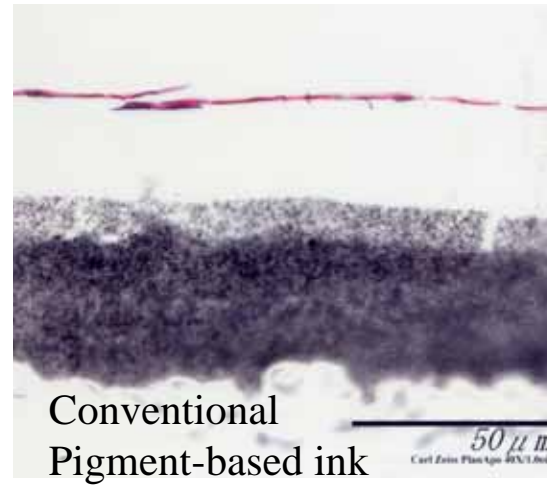
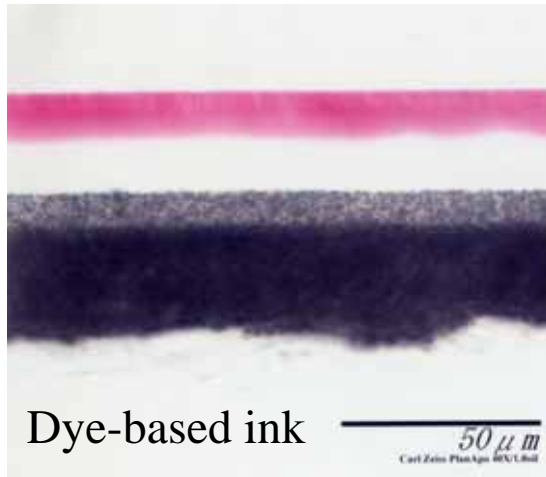


Fig.9

Evaluation of printed images

Table 2

Ink	Light fastness	Gloss	Rubbing resistance
Pigment precursor	good	high	good
Conventional Pigment	excellent	low	poor
Dye	poor	high	good

Conclusion

We synthesized the Quinacridone Type water soluble pigment precursor.

The ink of this study has brought high gloss, good light fastness and good rubbing resistance.