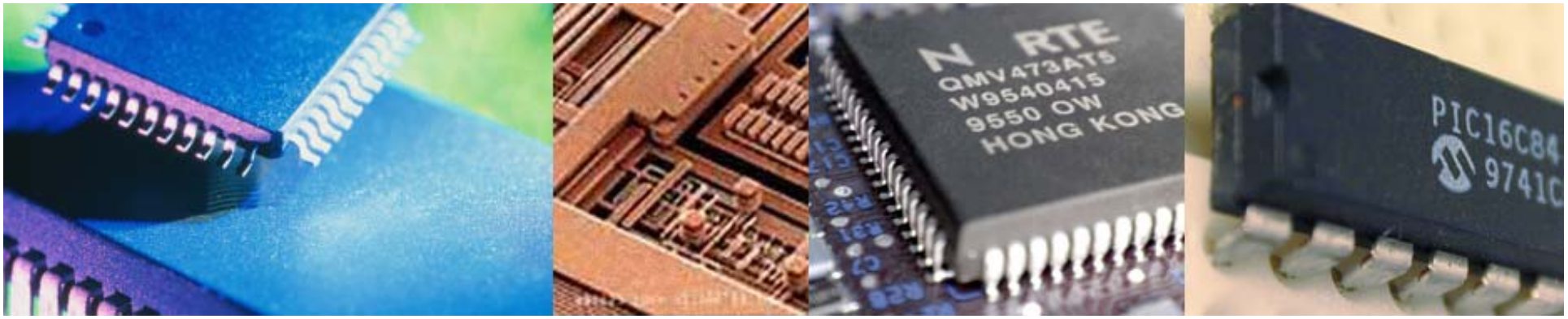
Photoacid Generators for Microlithography



CGI 725 (developmental product)

Highly sensitive, transparent PAG for
Chemically Amplified i-line Photoresists

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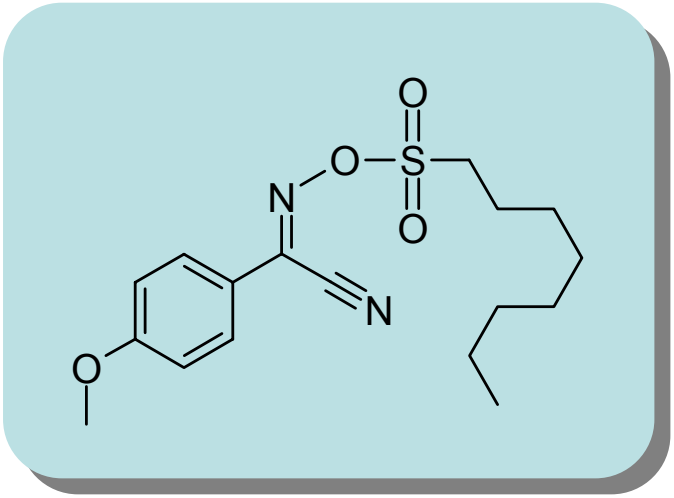
CGI 725 (developmental product)



PAG with high i-line sensitivity and thermally stable

- Non-ionic and halogen-free PAG
- High sensitivity at i-line
- Good thermal stability
- High solubility

PAG	Abs_{365nm} (0.01g/L in acetonitrile)	Solubility in PGMEA (%)	Td_{neat} (°C)	$E_{1:1}^{nega}$ (mJ/cm^2)	P-parameter
CGI 725	0.024	>30	210	3.3	0.079
IRGACURE® PAG103 (CGI 1397)	0.109	20	152	7.1	0.774

IRGACURE® is a registered trademark of Ciba Specialty Chemicals

Td_{neat}: decomposition temperature in neat form determined by DTA

P-parameter: a metric for photo reaction efficiency. P = Abs_{365nm} X $E_{1:1}^{nega}$

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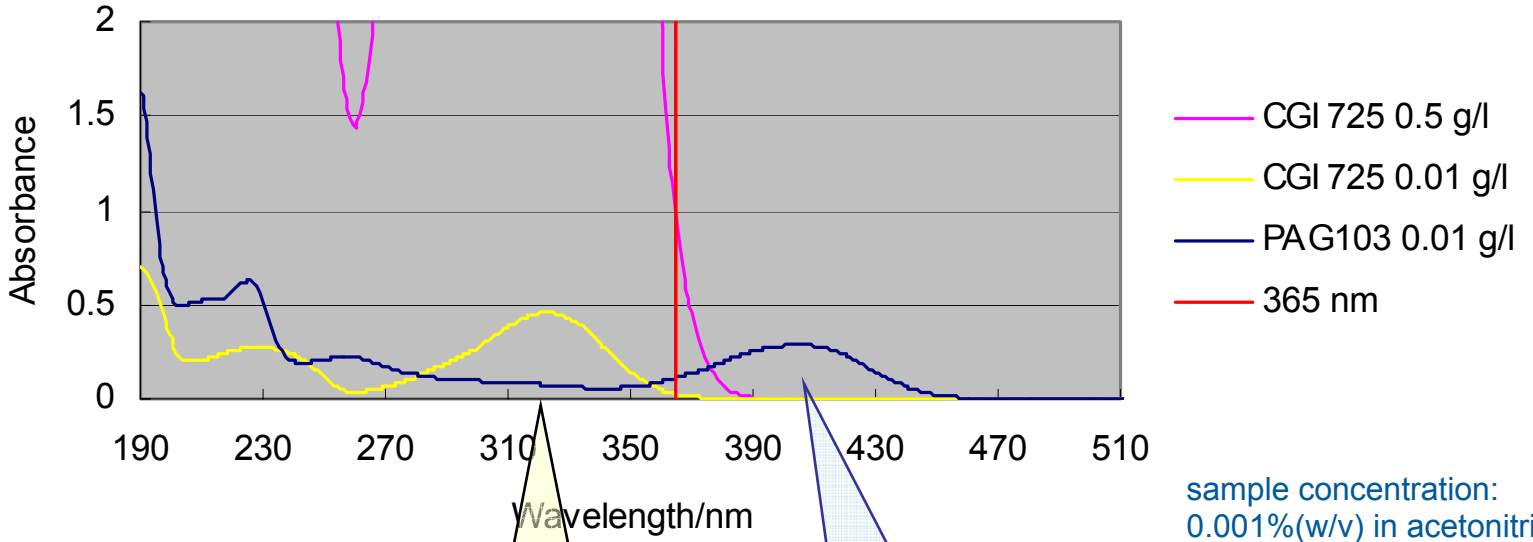
Absorption Spectrum of CGI 725



sample concentration:
0.001%(w/v) in acetonitrile

CGI 725
Absorption at i-line region

Red-shifted profile of IRGACURE® PAG103

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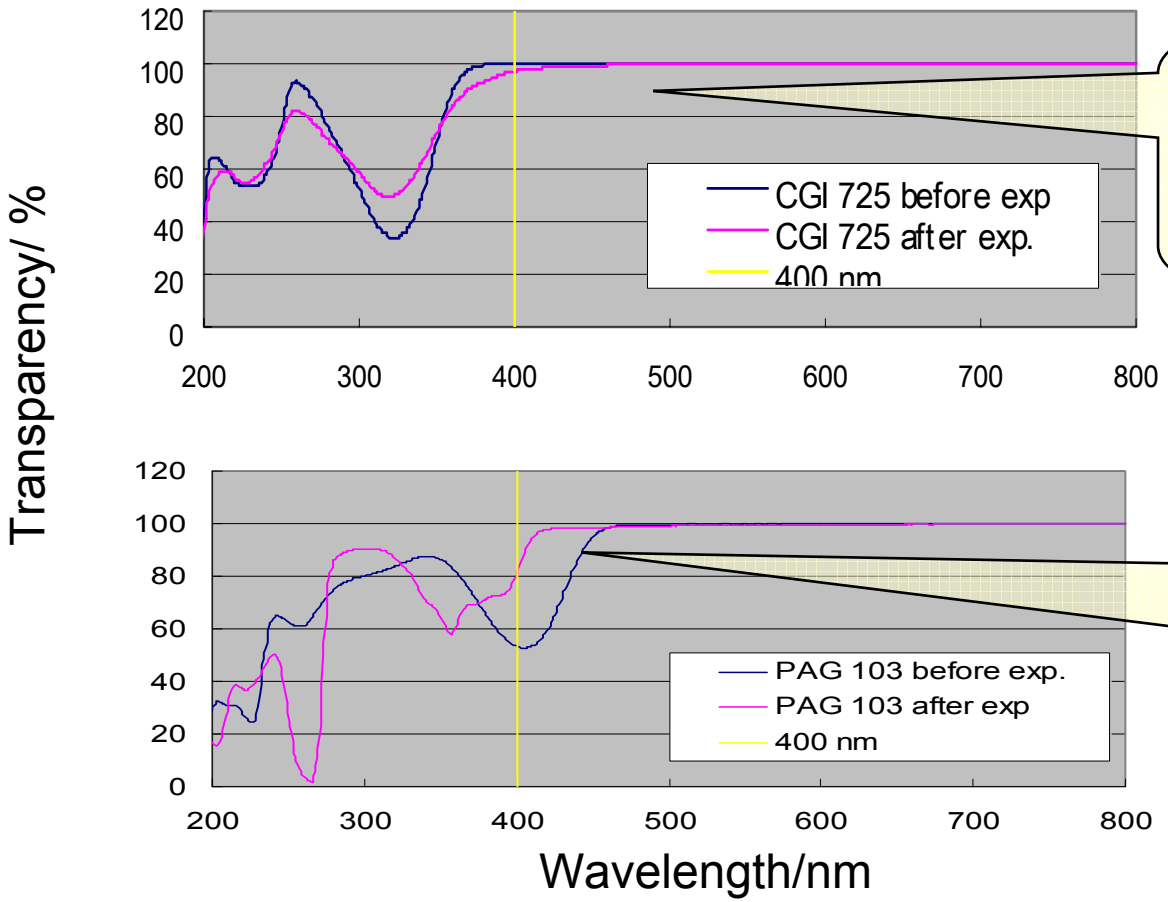
Transparency Change Before and After Exposure



transparent in visible region before and after exposure

less transparent in visible region than CGI 725

sample concentration:
0.001%(w/v) in acetonitrile

Exposure: i-line by 672 mJ/cm^2

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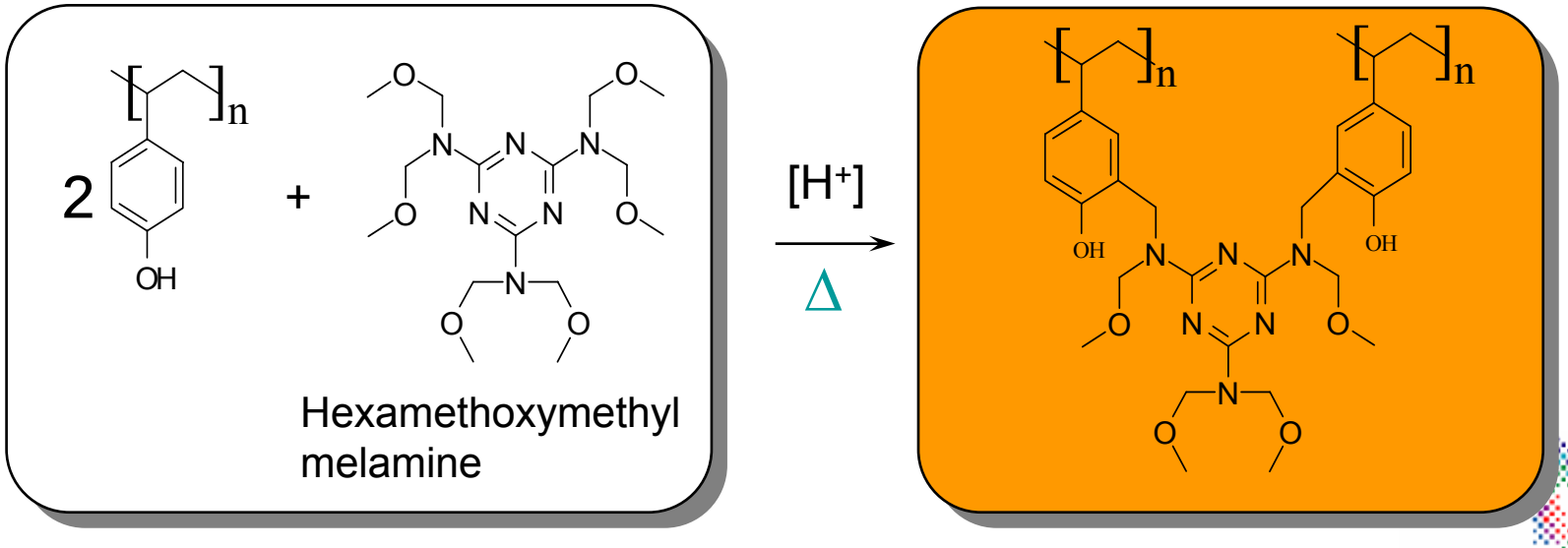
Sensitivity Measurement - Negative CA Resist -

Formulation:	Poly(HS)	65 parts
	Hexamethoxymethyl melamine	30 parts
	PAG	5 parts
	PGMEA	257 parts
Spin-coating:	1000 nm thickness	
Soft bake:	120 ºC / 60sec	
Exposure:	365 nm (i-line)	
PEB:	120 ºC / 60sec	
Development:	2.38% TMAH / 60sec	



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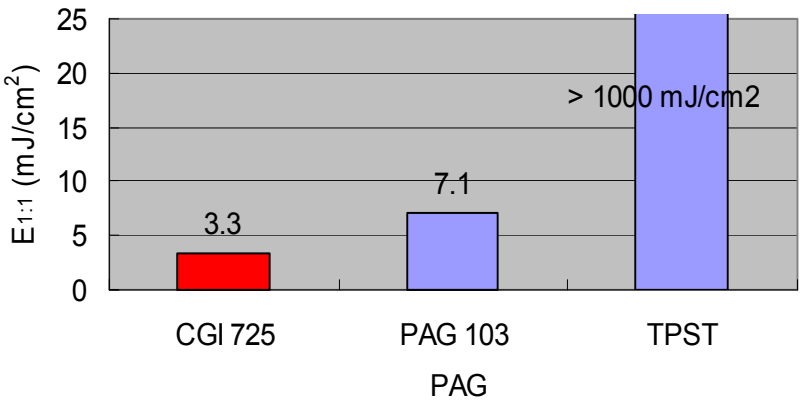
Performance in Model Formulation

Sensitivity at i-line



Absorption at 193nm

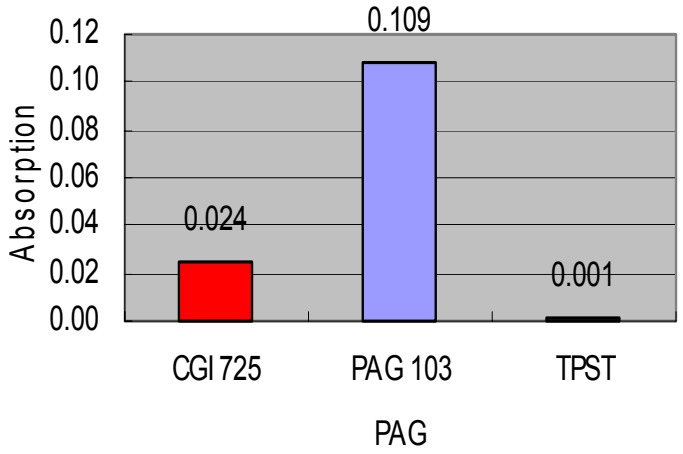
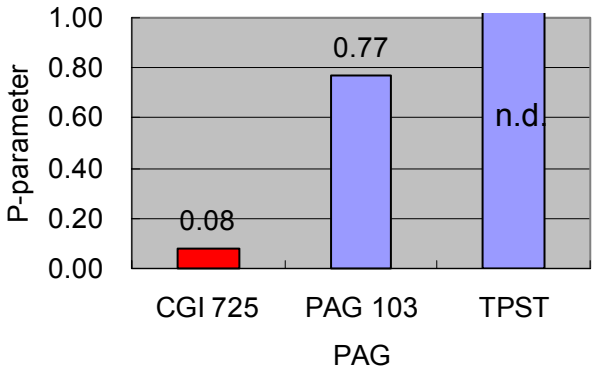


Photo-efficiency :
P-parameter = E_0 x [light absorbed by PAG]



CGI 725 showed the highest photo efficiency with high sensitivity and high transparency.

Ciba Photoacid Generators

CGI 725

is suitable for;

chemically amplified resist:

- positive and negative tone,
- low energy activation type,
- application requires high transparency especially at visible reason (400 ~ 800 nm) before and after exposure

as light sources:

- i-line (365 nm)

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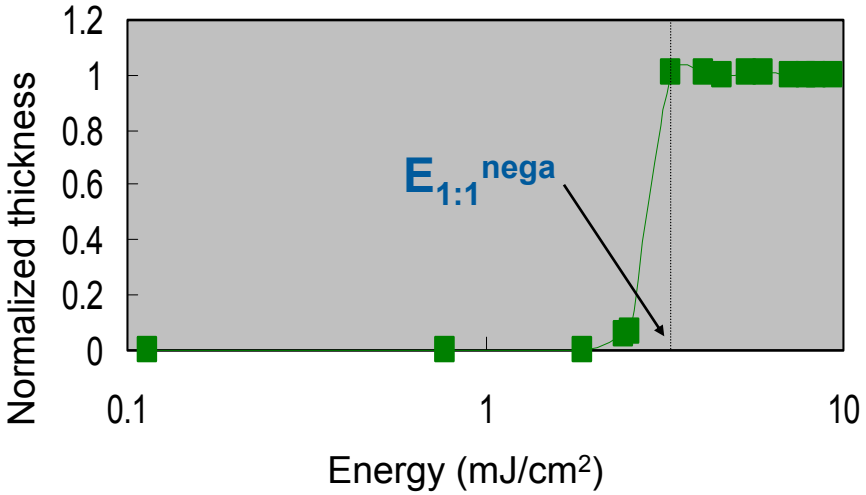
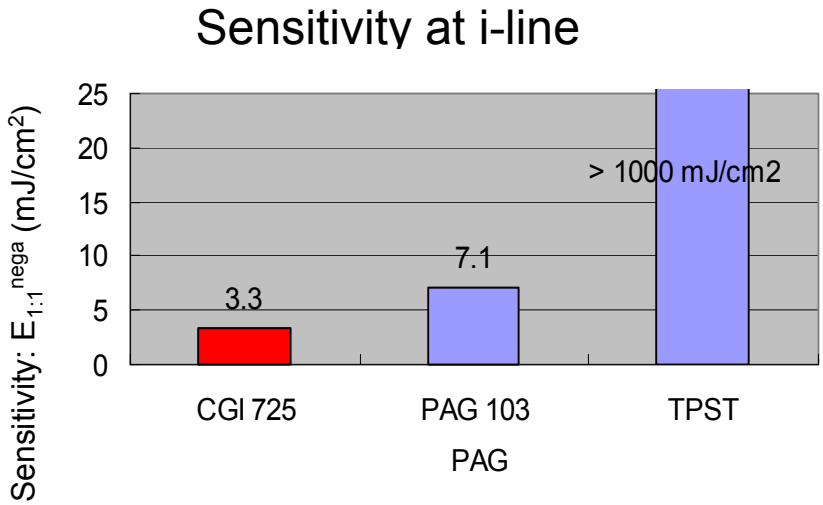
Sensitivity Measurement - Negative CA Resist -

Negative tone resist





TPST: triphenylsulfonium triflate

$E_{1:1}^{nega}$: energy of doze necessary to obtain full resist thickness for negative tone resist

CGI 725 shows high sensitivity at i-line.

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