ZEONREXElectronicChemicals

ZEP520

HighResolutionPositive ElectronBeamResist

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Anyprocessconditionsanddataareexamples.
Thosewillnotguaranteethesamedataincustomers ’ process.

1.Characteristics

ZEP520 series are high performance positive EB resists which show high resolution, highsensitivityandhighdryetchresistance.
TheyaresuitableforvariousEBprocesses.

(1)Resolution
Showhighresolutionandrectanglepatternprofile

(2)Resistancetodryetching
Showhighdryetchresistanceandarealmostequivalenttothat of positivephotoresistsgenerallyused

(3)Sensitivity
Showhighsensitivity

2.Properties

Item	Mw	Viscosity (mPa•s)	Solvent	Form
ZEP520-12	57,000	12	o-Dichlorobenzene	1QTbottle or 100mlbottle
ZEP520		22		
ZEP520A7		7	Anisole	
ZEP520A		11		

3.Thinner

Item	Composition	Remarks	Form
ZEP-S	o-Dichlorobenzene	ZEP520-12	1QTbottle
		ZEP520	
ZEP-A	Anisole	ZEP520A7	
		ZEP520A	

4.Developer

Item	Composition	Remarks	Form
ZEP-RD	Xylene(o -,m-,p- mixed)	standard	1GLbottle
ZEP-N50	n-Amylacetate	highresolution	
ZED-WN	o-Xylene	highresolution	
ZEP-SD	2-Butanone 40% Methylisobutylketone 60%	highsensitivity	

5.Rinse

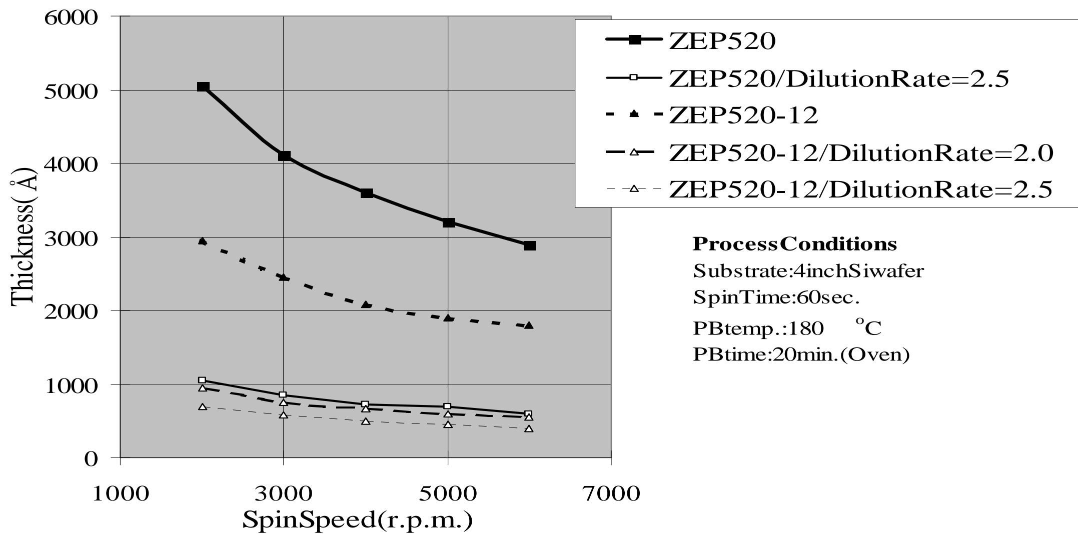
Item	Composition	Remarks	Form
ZMD-B	Methylisobutylketone 89% Isopropylalcohol 11%		1GLbottle

6.Remover

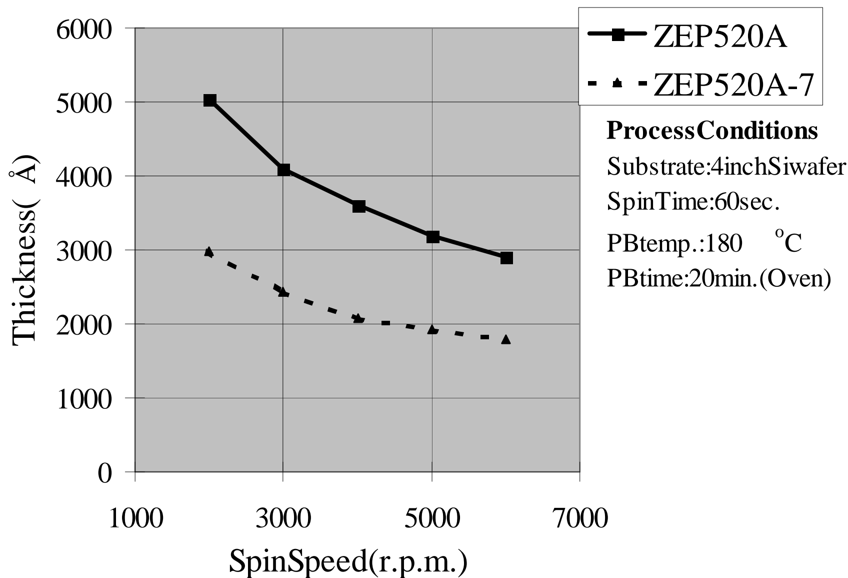
Item	Composition	Remarks	Form
ZDMAC	Dimethylacetamide		1GLbottle

7.SpinCurve

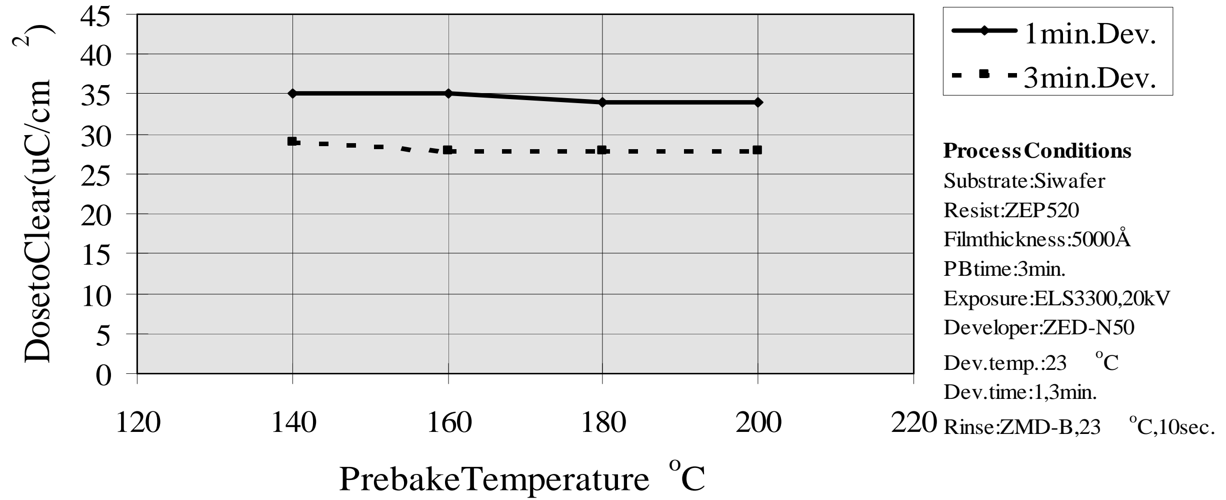
ZEP520SpinCurve

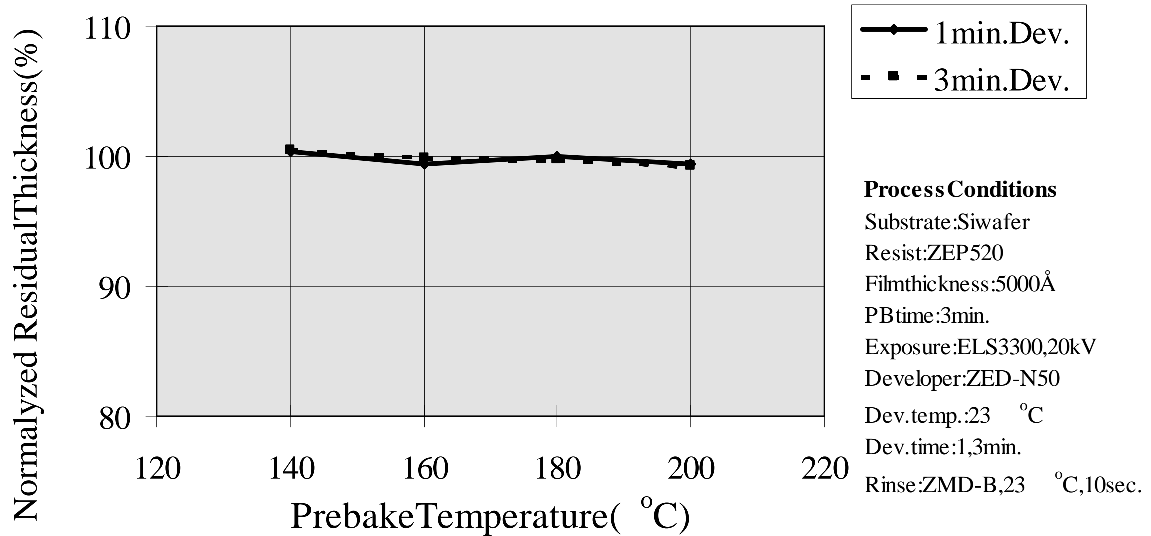


ZEP520ASpinCurve

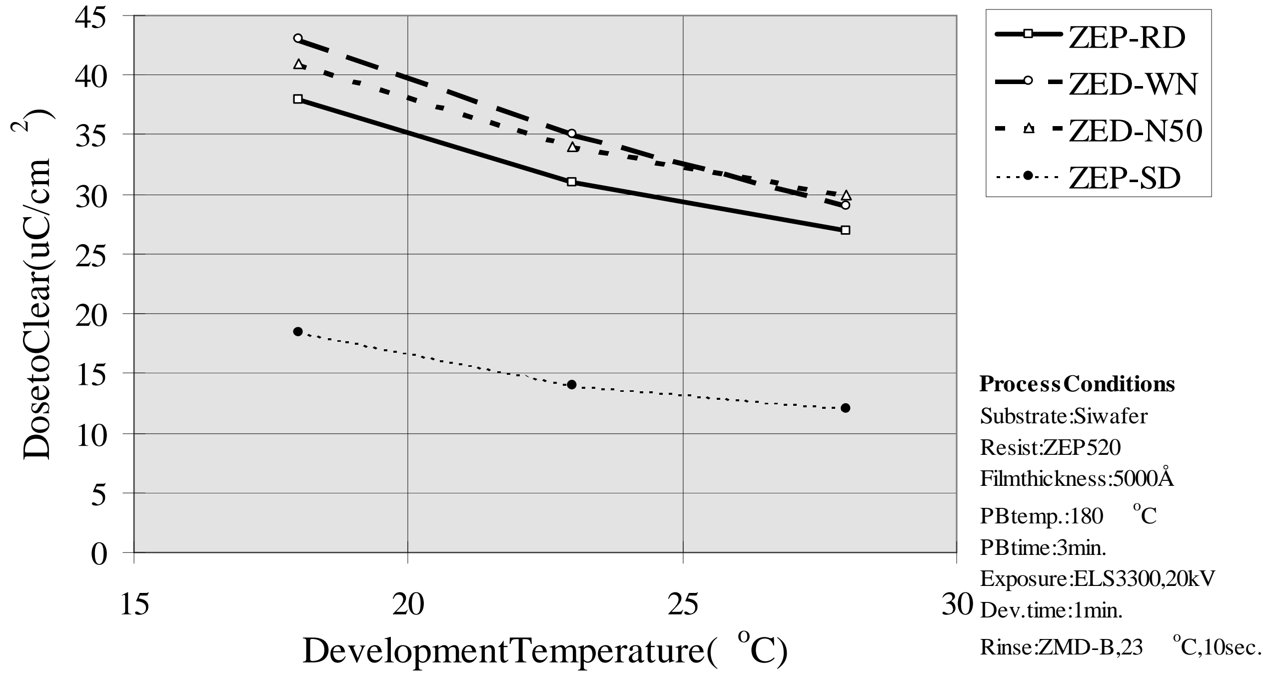


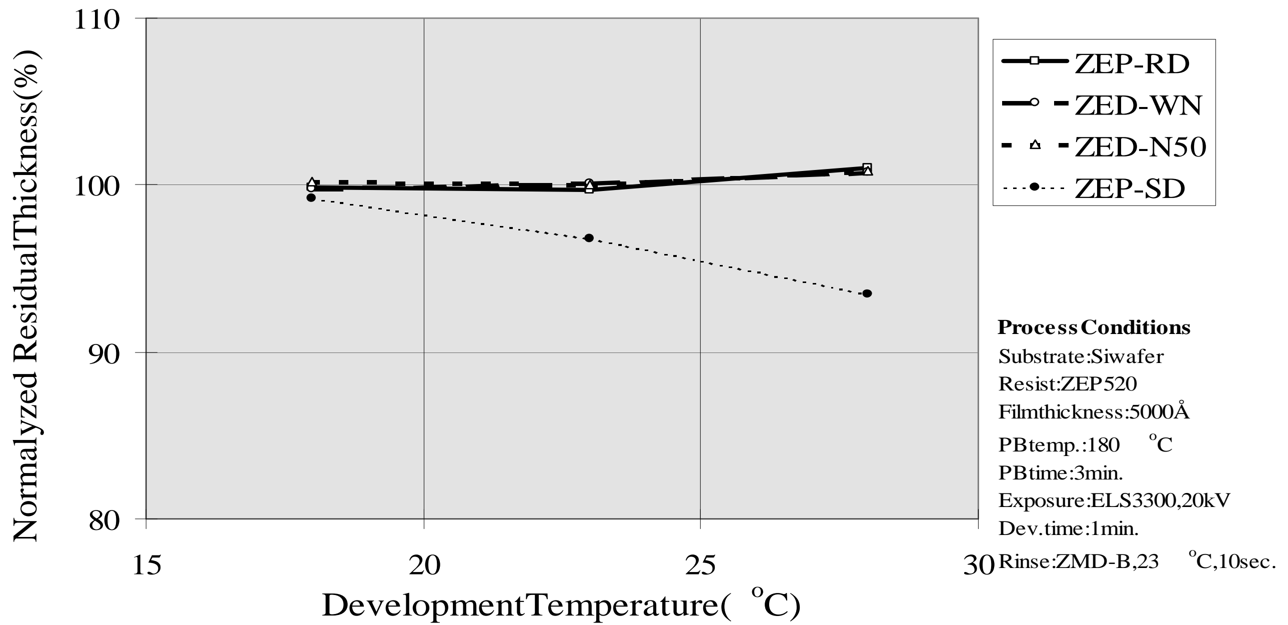
8.DependenceonPre -bakeTemperature





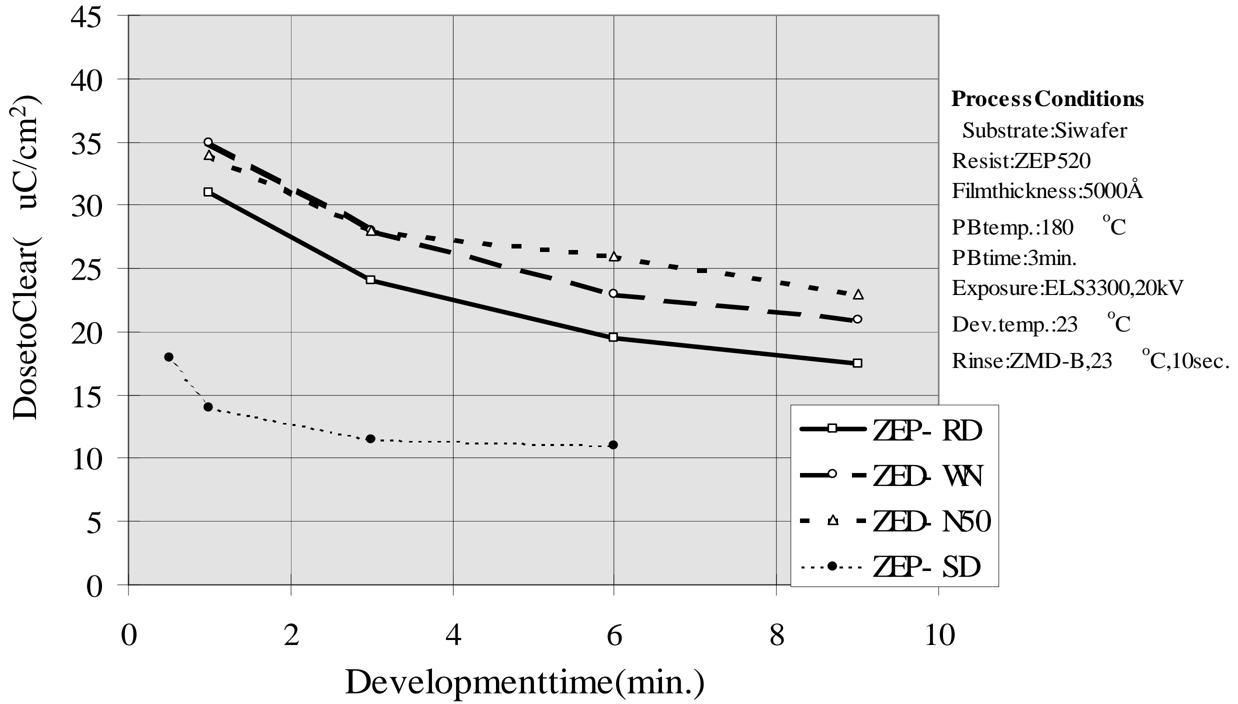
9.DependenceonDevelopmentTemperature

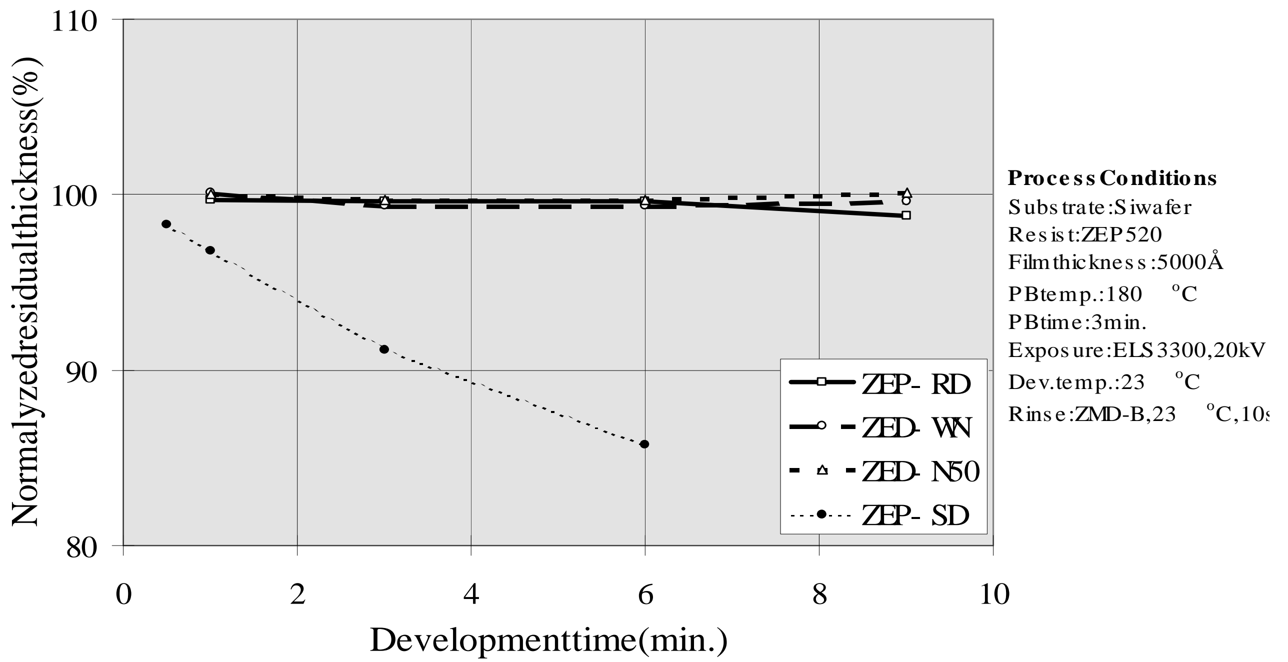




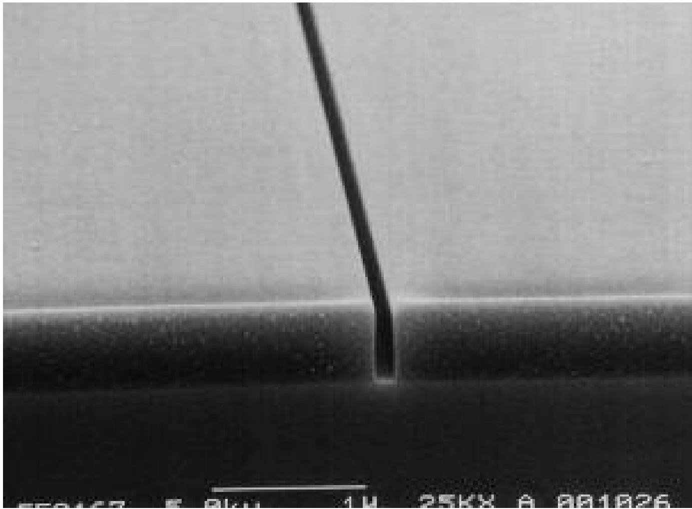
9.DependenceonDevelopmentTime

Å





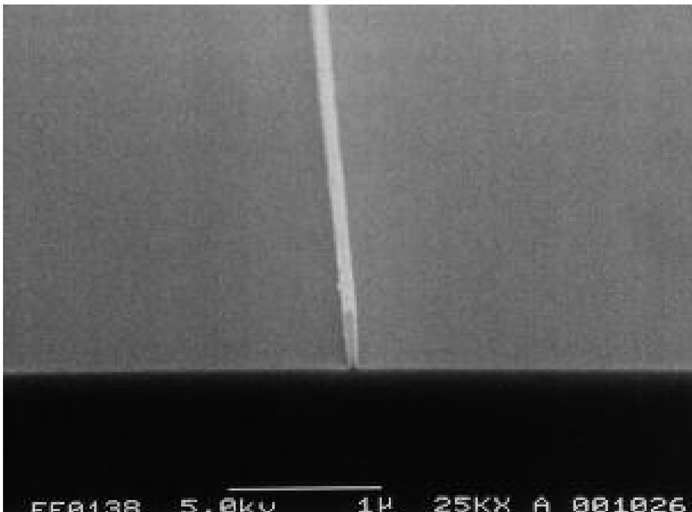
10.ApplicationExamples



0.15µmIsolatedSpace

ProcessConditions

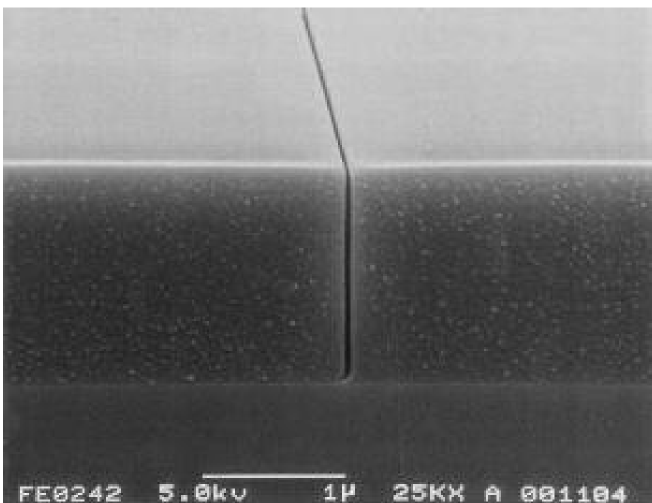
Resist:ZEP520
Filmthickness:5000 Å
PBtemp.:180 °C
PBtime:2min.
Exposure:30kV,5×10^{-11}A,1lineexp.
50×10^{-5}µC/cm
Dev.temp.:ZED -WN,23 °C,30sec.
Rinse:IPA,23 °C,20sec.



0.1µmIsolatedLine

ProcessConditions

Resist:ZEP520
Filmthickness:5000 Å
PBtemp.:180 °C
PBtime:2min.
Exposurearea:100 µm(20000 × 20000dot)
Exposure:30kV,5×10^{-11}A,1lineexp.
0.7µsec./dot
Dev.temp.:ZED -WN,23 °C,60sec.
Rinse:IPA,23 °C,20sec.



0.05µmIsolatedSpace

ProcessConditions

Resist:ZEP520
Filmthickness:15000 Å
Exposure:75kV

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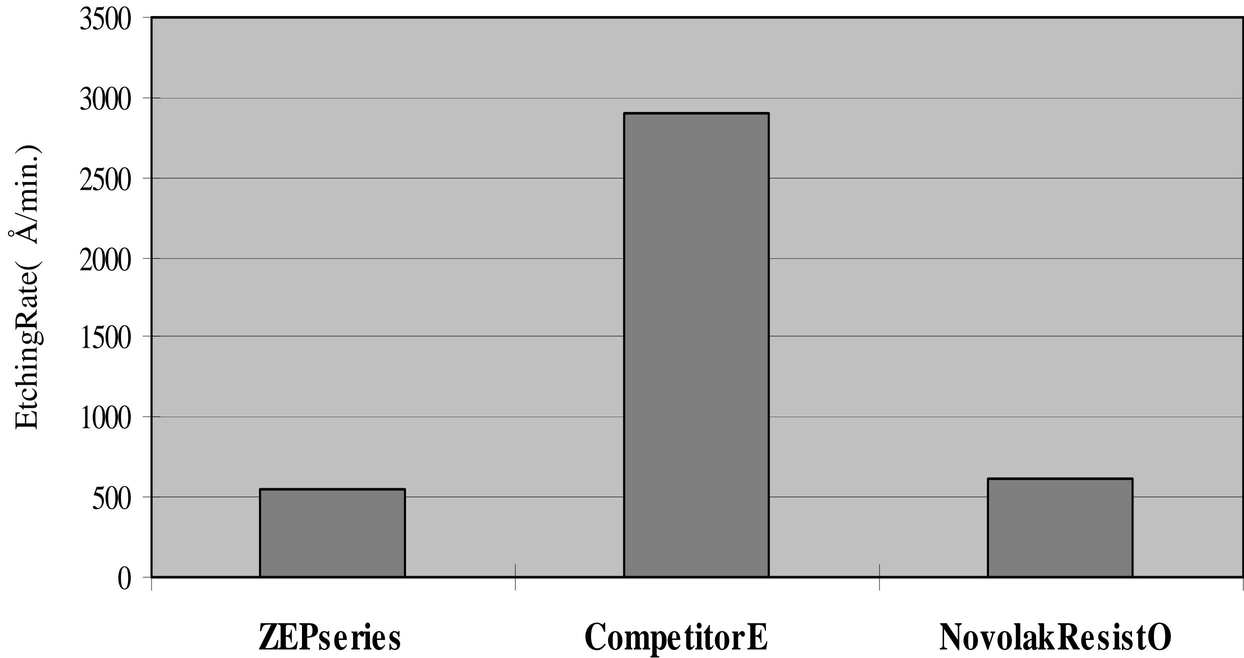
11.DryEtchingResistance

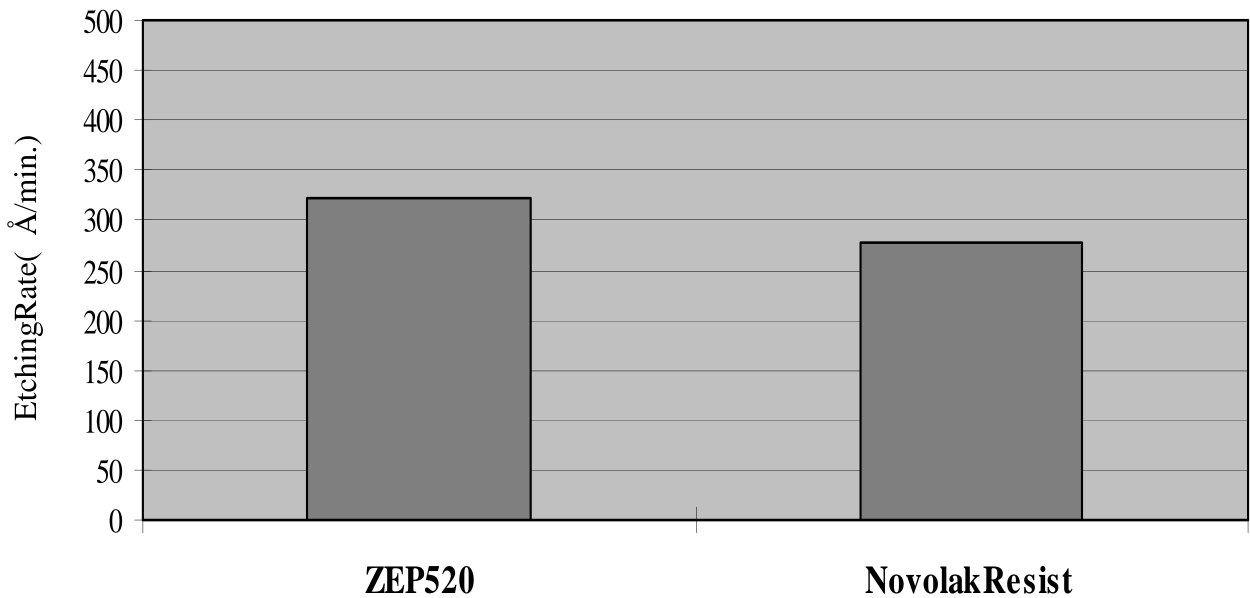
(1)CF_4 DryEtchingRate

CF_4 DryEtchingConditions
0.15torr,70sqcm,200W



(2)Cl_2+O_2 DryEtchingRate

Cl_2+O_2 DryEtchingConditions
Cl_2/O_2=4/1,5min.



12.ExampleofProcessConditions

(1)Coating	**ZEP520/520A2000rpm ×60sec → 5000Å** **ZEP520-12/520A-72000rpm ×60sec → 3000Å**
(2)Pre -bake	**170-200°C×20-30min.(Oven)** **170-200°C×2-5min.(HotPlate)**
(3)Exposure	**20-50µC/²cmat20kV**
(4)Development	**20-25°C×60-360sec.(Dipping)** **ZEP-RD,ZED -N50,ZED -WN**
(5)Rinse	**20-25°C×10-60sec.(Dipping)** **ZMD-B**
(6)Postbake	**Incaseofwetetching** **100-140°C×20-30min.(Oven)** **100-140×2-3min.(HotPlate)**
(7)De -scum	**O_2-plasma**
(8)Etching	**Dryprocessandwetprocesscanbeused.** **WetEtchingsolutionforCr** **Ammoniumcerium(IV)nitrate $(NH_4)_2Ce(NO_3)_6$ 13-18wt%** **Perchloricacid $HClO_4$ 3-8wt%** **Purewater H_2O 77-84wt%**
(9)Resist Removing	**<deep -UV+organicsolvent >** **1st step:185nm+254nm,10mW/cm ^{2},3min.-irradiation** **2nd step:** **Dimethylacetamide(DMAC)or1 -Methyl-2-pyrrolidinone(NMP), 23°C×1min.** ***AsthepolymerofZEP520isdecomposedbydeep -UVirradiation, itcanbe easilyremoved.** **<organicsolvent>** **N-methyl-2-pyroridone(30 -35°C)** **<hotH_2SO_4-H_2O_2 >** **hotH_2SO_4-H_2O_2 (90-100°C)**

13.HandlingPrecautions

(1)FlammableLiquid
(2)Harmfulbyinhalation
(3)Avoidcontactwithskinandeyes

CAUTION:Opencarefully.Useinwellventilatedarea.In caseofcontactwithskin andeyes,rinseimmediatelywith plentyofwaterfor15minutesandgetmedical attention. IncaseoffireuseAlcoholformCO $_2$ ordrychemical,never usewater.

STORAGE:Keepcappedandawayfromoxidants,sparks andopenflame.Storeat cool[32 ^{o}F(0 ^{o}C) - 77°F(25 ^{o}C)],darkplace.Useincleanroom.

14. Appendix

(1)RefractiveIndexofZEP520Film

CauchyCoefficient

$n = n_0 + n_1/\lambda^2 + n_2/\lambda^4$

$n_0 = 1.541093$

$n_1 = 4.113002 \times 10^5$

$n_2 = 4.070357 \times 10^{12}$

Absorptioncoefficient=0

Unitof λ : Å

MeasuredbyUV -1250/SE(KLATencor)

(2)GlassTransitionTemperatureofZEP520Polymer

Tg:105 ^{o}CMeasuredbyDSC

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