

Claim 10 of U.S. Patent No. 5,591,678 to Bendik et al. (“the ’678 Patent”) is obvious under 35 U.S.C. § 103 over Cade in view of Petersen

Prior Art Cited in this Chart:

U.S. Patent No. 4,599,792 to Cade et al. (“Cade”)

Kurt E. Petersen (*Silicon as a Mechanical Material*, Proceedings of the IEEE, Vol. 70, No. 5 (May 1982) (“Petersen”))

Claim Language	Cade in view of Petersen
<p align="center">Claim 10</p>	
<p>The method of claim 1, wherein the step of etching includes the step of contacting the etchable layer to a liquid etchant that attacks the etchable layer rapidly and the etch-stop layer slowly.</p>	<p>“The etch-back of the seed substrate 80 is performed with hydrofluoric-nitric-acetic acid (HNA) in the proportions of 1:3:8. The etchant HNA is an isotropic etch and attacks heavily doped p+ or n+ silicon. However, it does not appreciably attack silicon doped below the level of 10^{18} /cm³. The etch stopping characteristics are improved by the p+ /n junction at the interface 82.” Cade, 7:31-37.</p> <p>“Table II gives a brief summary of the characteristics of a number of common wet silicon etches.” Petersen, at 423.</p> <p>“Three etchant systems are of particular interest due to their versatility: ethylene diamine, pyrocatechol, and water (EDP) [22]; KOH and water [23]; and HF, HNO₃, and acetic acid CH₃OOH (HNA) [24]. [25].” Petersen, at 423.</p> <p>Table II of Petersen, at 424</p>

Claim Language

Cade in view of Petersen

TABLE II

Etchant (Diluent)	Typical Composi- tions	Temp °C	Etch Rate ($\mu\text{m}/\text{min}$)	Anisotropic Etch Rate Ratio (100)/(111)	Dopant Dependence	Masking Films (etch rate of mask)	References
HF HNO ₃ (water, CH ₃ COOH)	10 ml 30 ml 80 ml	22	0.7-3.0	1:1	$\leq 10^{17}\text{cm}^{-3}$ n or p reduces etch rate by about 150	SiO ₂ (300Å/min)	24,25,28,30
	25 ml 50 ml 25 ml	22	40	1:1	no dependence	Si ₃ N ₄	
	9 ml 75 ml 30 ml	22	7.0	1:1	-----	SiO ₂ (700Å/min)	
Ethylene diamine Pyrocatechol (water)	750 ml 120 gr 100 ml	115	0.75	35:1	$\geq 7 \times 10^{18}\text{cm}^{-3}$ boron reduces etch rate by about 50	SiO ₂ (2Å/min) Si ₃ N ₄ (1Å/min) Au, Cr, Ag, Cu, Ti	20,26,27,35, 43,44
	750 ml 120 gr 240 ml	115	1.25	35:1			
KOH (water, isopropyl)	44 gr 100 ml	85	1.4	400:1	$\geq 10^{20}\text{cm}^{-3}$ boron reduces etch rate by about 20	Si ₃ N ₄ SiO ₂ (14Å/min)	23,32,33,36, 37,38,42
	50 gr 100 ml	50	1.0	400:1			
	100 ml 100 ml	100	2.0	---			
NaOH (water)	10 gr 100 ml	65	0.25-1.0	---	$\geq 3 \times 10^{20}\text{cm}^{-3}$ boron reduces etch rate by about 10	Si ₃ N ₄ SiO ₂ (7Å/min)	34