

## Supporting information

Part A:  $^1\text{H-NMR}$  and MALDI-TOF data of all synthesized amines.

**2. N-benzyl-N-4-fluorobenzylamine:** Light yellow liquid.  $^1\text{H NMR}$  (300 MHz,  $\text{CDCl}_3$ , 25 °C):  $\delta$ = 7.4 (m, 5H,  $\text{C}_6\text{H}_5$ ), 7.2 (d, 4H,  $\text{C}_6\text{H}_4$ ), 3.8 (d, 4H, 2 $\text{CH}_2$ ). Mw= [M+H] = 215.7419 g/mol

**3. Bis-(4-fluorobenzyl)amine:** Yellow liquid.  $^1\text{H NMR}$  (300 MHz,  $\text{CDCl}_3$ , 25 °C):  $\delta$ = 7.3 (m, 4H,  $\text{C}_6\text{H}_4$ ), 6.9 (m, 4H,  $\text{C}_6\text{H}_4$ ), 3.8 (d, 4H, 2 $\text{CH}_2$ ). Mw= [M+H] = 233.5966 g/mol

**4. N-4-cyanobenzyl-benzonitrile:** (*For this reaction, the general reaction procedure was followed, except during the reduction step, the solution was not refluxed, but only allowed to stir at room temperature for 4 hours.*) Yellow-brown liquid.  $^1\text{H NMR}$  (300 MHz,  $\text{CDCl}_3$ , 25 °C):  $\delta$ = 7.6 (d, 2H,  $\text{C}_6\text{H}_4$ ), 7.5 (d, 2H,  $\text{C}_6\text{H}_4$ ), 7.3 (m, 5H,  $\text{C}_6\text{H}_5$ ), 4.1(s, 2H,  $\text{CH}_2$ ), 3.9(s, 2H,  $\text{CH}_2$ ). Mw= [M+H] = 223.0410 g/mol

**5. N-benzyl-N-4-methoxybenzylamine:** Light yellow liquid.  $^1\text{H NMR}$  (300 MHz,  $\text{CDCl}_3$ , 25 °C):  $\delta$ = 7.3 (m, 5H,  $\text{C}_6\text{H}_5$ ), 7.2 (d, 2H,  $\text{C}_6\text{H}_4$ ), 6.9 (d, 2H,  $\text{C}_6\text{H}_4$ ), 3.8(d, 7H, 2 $\text{CH}_2$ ,  $\text{OCH}_3$ ). Mw= [M+H] = 227.7604 g/mol

**6. Bis-(4-methoxybenzyl)amine:** Yellow liquid.  $^1\text{H NMR}$  (300 MHz,  $\text{CDCl}_3$ , 25 °C):  $\delta$ = 7.6 (d, 4H, 2 $\text{C}_6\text{H}_4$ ), 7.3 (d, 4H, 2 $\text{C}_6\text{H}_4$ ), 4.1(s, 6H,  $\text{OCH}_3$ ), 3.9(s, 4H, 2 $\text{CH}_2$ ). Mw= [M+H] = 258.8854 g/mol

**7. Bis-(2,4-dimethoxybenzyl)amine:** (*Purchased from Merck KGaA, 99%*). Almond coloured powder.  $^1\text{H NMR}$  (300 MHz,  $\text{CDCl}_3$ , 25 °C):  $\delta$ = 7.1 (d, 2H,  $\text{C}_6\text{H}_3$ ), 3.8 (d, 12H, 2x $\text{OCH}_3$ ), 3.7 (s, 2H,  $\text{CH}_2$ ). Mw= [M+H] = 317.5214 g/mol

**8. N-benzylaniline:** Brown liquid.  $^1\text{H NMR}$  (300 MHz,  $\text{CDCl}_3$ , 25 °C):  $\delta$ = 7.3 (m, 5H,  $\text{C}_6\text{H}_5$ ), 7.2 (d, 2H,  $\text{C}_6\text{H}_4$ ), 6.7 (m, 3H,  $\text{C}_6\text{H}_5$ ), 4.3(s, 2H,  $\text{CH}_2$ ). Mw= [M+H] = 183.8854 g/mol

**9. N-benzyl-4-fluoroaniline:** Light brown liquid.  $^1\text{H NMR}$  (300 MHz,  $\text{CDCl}_3$ , 25 °C):  $\delta$ = 7.3 (m, 5H,  $\text{C}_6\text{H}_5$ ), 6.8 (t, 2H,  $\text{C}_6\text{H}_4$ ), 6.6 (q, 2H,  $\text{C}_6\text{H}_4$ ), 4.3 (s, 2H,  $\text{CH}_2$ ). Mw= [M+H] = 201.8775 g/mol

**10. N-benzyl-4-methoxyaniline:** Dark, black brown liquid.  $^1\text{H NMR}$  (300 MHz,  $\text{CDCl}_3$ , 25 °C):  $\delta$ = 7.3 (m, 5H,  $\text{C}_6\text{H}_5$ ), 6.8 (d, 2H,  $\text{C}_6\text{H}_4$ ), 6.6 (d, 2H,  $\text{C}_6\text{H}_4$ ), 4.3(s, 2H,  $\text{CH}_2$ ), 3.7(s, 3H,  $\text{OCH}_2$ ). Mw= [M+H] = 213.4167 g/mol

**11. N-benzylnaphthalen-1-ylmethanamine:** Brown liquid,  $^1\text{H NMR}$  (300 MHz,  $\text{CDCl}_3$ , 25 °C):  $\delta$ = 8.1 (d, 1H,  $\text{C}_{10}\text{H}_7$ ), 7.8 (dd, 2H,  $\text{C}_{10}\text{H}_7$ ), 7.3 (m, 9H,  $\text{C}_6\text{H}_5$ ,  $\text{C}_{10}\text{H}_7$ ), 4.3 (s, 2H,  $\text{CH}_2$ ), 3.9 (s, 2H,  $\text{CH}_2$ ). Mw= [M+H] = 247.7438 g/mol

**12. 1-(9-anthryl)-N-benzylmethanamine:** Yellow solid.  $^1\text{H NMR}$  (300 MHz,  $\text{CDCl}_3$ , 25 °C):  $\delta$ = 8.4 (s, 1H,  $\text{C}_{14}\text{H}_9$ ), 8.2 (d, 2H,  $\text{C}_{14}\text{H}_9$ ), 8.0 (d, 2H,  $\text{C}_{14}\text{H}_9$ ), 7.3 (m, 11H,  $\text{C}_6\text{H}_5$ ,  $\text{C}_{10}\text{H}_7$ ), 4.7 (s, 2H,  $\text{CH}_2$ ), 4.0 (s, 2H,  $\text{CH}_2$ ). Mw= [M+H] = 297.0961 g/mol

**13. Bis-(1-naphthylmethyl)amine:** Brown liquid,  $^1\text{H NMR}$  (300 MHz,  $\text{CDCl}_3$ , 25 °C):  $\delta$ = 8.1 (d, 2H, 2 $\text{C}_{10}\text{H}_7$ ), 7.9 (d, 2H, 2 $\text{C}_{10}\text{H}_7$ ), 7.8 (d, 2H, 2 $\text{C}_{10}\text{H}_7$ ), 7.3 (m, 8H, 2 $\text{C}_{10}\text{H}_7$ ), 4.4 (s, 4H, 2 $\text{CH}_2$ ). Mw= [M+H] = 297.8560 g/mol

**14. 1-(1-pyrenyl)-N-benzylmethanamine:** Orange solid.  $^1\text{H}$  NMR (300 MHz,  $\text{CDCl}_3$ , 25 °C):  $\delta$ = 8.3 (d, 1H,  $\text{C}_{16}\text{H}_9$ ), 8.0 (m, 8H,  $\text{C}_{16}\text{H}_9$ ), 7.3 (m, 5H,  $\text{C}_6\text{H}_5$ ), 4.0 (s, 2H,  $\text{CH}_2$ ). Mw= [M+H] = 321.8269 g/mol

**15. 1-(1-naphthyl)-N-(1-naphthylmethyl)methanamine:** White flakes.  $^1\text{H}$  NMR (300 MHz, ( $\text{C}_6\text{D}_6$ , 25 °C):  $\delta$ = 8.1 (d, 1H,  $\text{C}_{10}\text{H}_7$ ), 7.8 (d, 2H,  $\text{C}_{10}\text{H}_7$ ), 7.7 (d, 2H,  $\text{C}_{10}\text{H}_7$ ), 7.3 (m, 7H,  $\text{C}_{10}\text{H}_7$ ), 4.6 (d, 2H,  $\text{CH}_2$ ). Mw= [M+H] = 282.5986 g/mol

Part B: Tabulated data of the etch rates and etch selectivity of the amine molecules used in this study

Amine identity	$\mathbf{Ku}$ (nm/min)	$\mathbf{Ke}$ (nm/min)	Selectivity ( $\gamma$ )
1	476	379	1.26
2	306	212	1.44
3	207	114	1.81
4	188	30	6.27
5	513	219	2.34
6	826	304	2.72
7	1020	349	2.92
8	NR	NR	-
9	NR	NR	-
10	NR	NR	-
11	111	33	3.36
12	84.7	5.02	16.87
13	59.7	5.31	11.24
14	98	0.87	113.79
15	NR	NR	-
16	210	0.61	344.26
triethylamine	NR	NR	-