Table SI-1. Summary of HPLC (UV) validation data for the quantification of PMA and MDMA obtained using an ACE 3 C18 column (150 mm x 4.6 mm i.d., particle size: 3 μm); flow-rate: 1.2 mL min^{-1}; mobile phase: aqueous potassium dihydrogen phosphate buffer (0.05 M, pH 3.2 ± 0.02): acetonitrile (90:10% v/v); detector wavelength (UV): 210 nm. See Figure 5 for representative chromatograms.

System	HPLC (UV)	
Flow rate (mL min^{-1})	1.2 mL min^{-1} (t_0 = 1.48 min)[a]	
Analyte	PMA (peak b)	MDMA (peak c)
t_R (min)	9.3	9.9
RRT[b]	0.94	1
Capacity Factor (k')	5.28	5.69
N (plates)	19,950 (133,000)[c]	19,655 (131,030)[c]
H (m)	7.52 x 10^{-6}	7.63 x 10^{-6}
Resolution (R_s)	-	2.2
Asymmetry Factor (A_s)	0.77	0.77
LOD[d] (μg mL^{-1})	0.09	0.04
LOQ[e] (μg mL^{-1})	0.26	0.12
Co-efficient of Regression	0.999[f]	1[g]
Precision (%RSD, n = 6) 1.25 μg mL^{-1}	0.41	0.38
2.5 μg mL^{-1}	0.31	0.26
5.0 μg mL^{-1}	0.10	0.17
10.0 μg mL^{-1}	0.11	0.18
20.0 μg mL^{-1}	0.03	0.22
40.0 μg mL^{-1}	0.06	0.12

Key: (a) Determined from the retention time of a solution of uracil (10 μg mL^{-1}, peak a) eluting from the column; (b) relative retention time (with respect to MDMA); (c) *N* expressed in plates per m; (d) limit of detection (based on the standard deviation of the response and the slope); (e) limit of quantification (based on the standard deviation of the response and the slope); (f) y = 14.2x – 2.8282; (g) y = 16.758x – 1.7864.

Table SI-2. Accuracy and precision results for the PMA and MDMA assay obtained using an ACE 3 C18 column (150 mm x 4.6 mm i.d., particle size: 3 µm); flow-rate: 1.2 mL min^{-1}; mobile phase: aqueous potassium dihydrogen phosphate buffer (0.05 M, pH 3.2 ± 0.02):acetonitrile (90:10% v/v); detector wavelength (UV): 210 nm. See Figure 5 for representative chromatograms.

Analyte	**PMA**						
Replicate (Sample)	*Peak Area (Sample)*			*Peak Area (Standard)*			*Assay %*
	Injection 1	*Injection 2*	*Mean*	*Injection 1*	*Injection 2*	*Mean*	
80% (8.0 µg mL^{-1})							
1	113.38	113.46	113.42	112.44	112.40	112.42	100.89
2	113.17	113.16	113.17				100.67
3	113.28	113.29	113.28				100.77
100% (10.0 µg mL^{-1})							
1	140.55	140.57	140.56	140.55	140.50	140.52	100.03
2	140.35	140.50	140.42				99.93
3	140.67	140.81	140.74				100.15
120% (12.0 µg mL^{-1})							
1	171.72	171.77	171.74	168.66	168.60	168.63	101.85
2	171.71	171.75	171.73				101.84
3	171.69	171.81	171.75				101.85
						Mean	100.89
						SD	0.79
						%RSD	0.78

Analyte	**MDMA**						
Replicate (Sample)	*Peak Area (Sample)*			*Peak Area (Standard)*			Assay %
	Injection 1	*Injection 2*	*Mean*	*Injection 1*	*Injection 2*	*Mean*	
80% (8.0 µg mL^{-1})							
1	139.80	139.37	139.59	138.39	138.39	138.39	100.87
2	139.78	139.20	139.49				100.80
3	139.51	139.40	139.46				100.77
100% (10.0 µg mL^{-1})							
1	172.51	172.88	172.70	172.99	172.91	172.95	99.85
2	172.60	172.90	172.75				99.89
3	172.99	173.41	173.20				100.14
120% (12.0 µg mL^{-1})							
1	209.94	210.06	210.00	207.58	207.49	207.54	101.19
2	209.97	211.07	210.52				101.44
3	209.86	210.07	209.96				101.17
						Mean	100.68
						SD	0.58
						%RSD	0.58

Figure SI-1.

Cyclic voltammograms of the SPE, boron doped diamond (BDD) and glassy carbon (GC) : (A) in 1000 µg $mL^{-1}$of PMA, (B) 500 µg mL^{-1} MDMA and (C) 500 µg mL^{-1}) / (1000 µg mL^{-1}) of MDMA / PMA in PBS (pH 7). (scan rate: 100 mV s^{-1}, *vs.* Ag/AgCl)

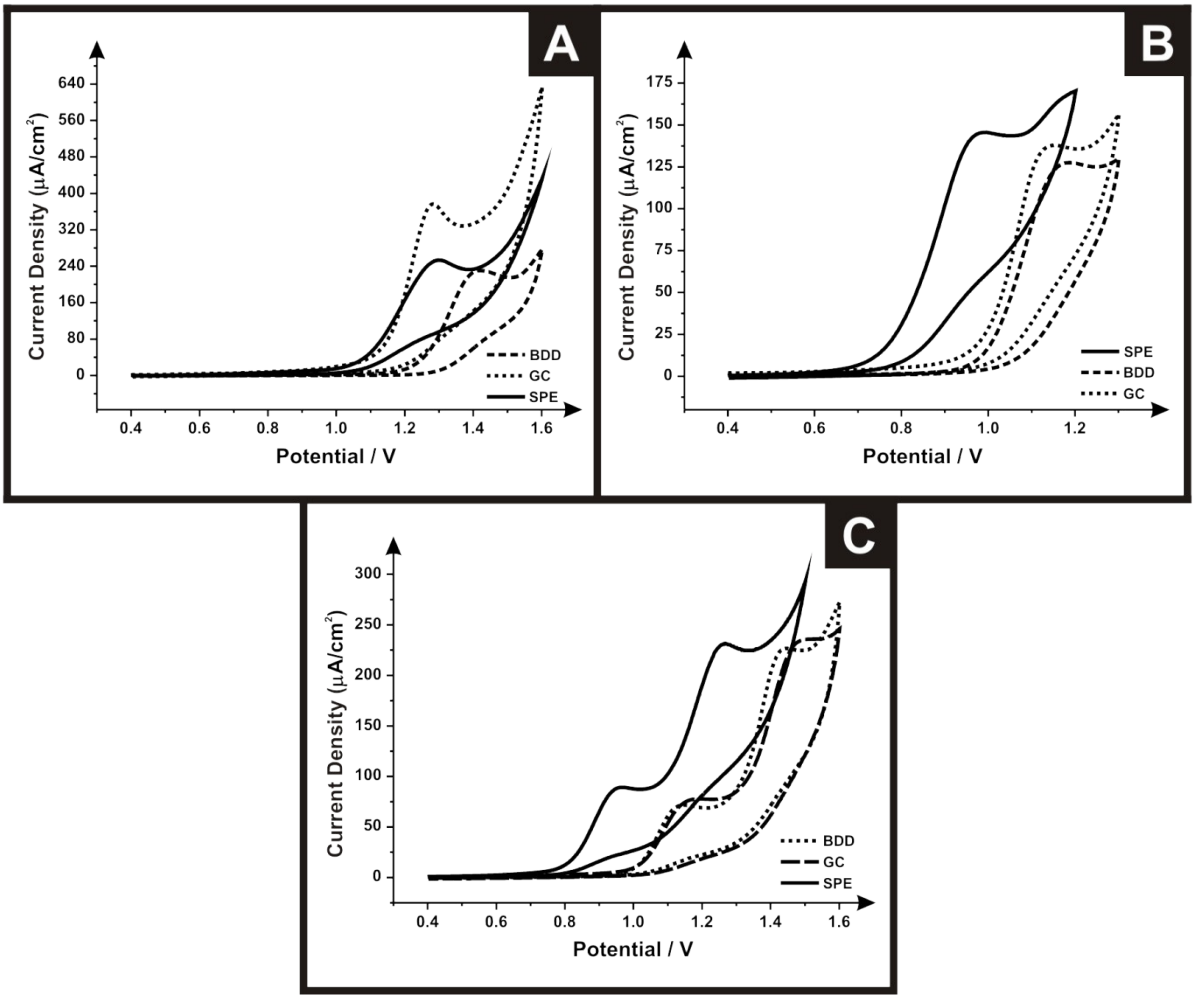


Figure SI-2.

Differential pulse voltamograms of the effect of the pH for the: (A) 500 µg mL^{-1} PMA, (B) 500 µg mL^{-1} MDMA and (C) 500 µg mL^{-1} PMA + 250 µg mL^{-1} MDMA in buffer phosphate over a range of pH (2 – 12) (E-step: 0.002 V; E-pulse: 0.1 V; t-pulse: 0.05 s; scan rate: 0.005 V s^{-1}; t-equilibration: 1s).

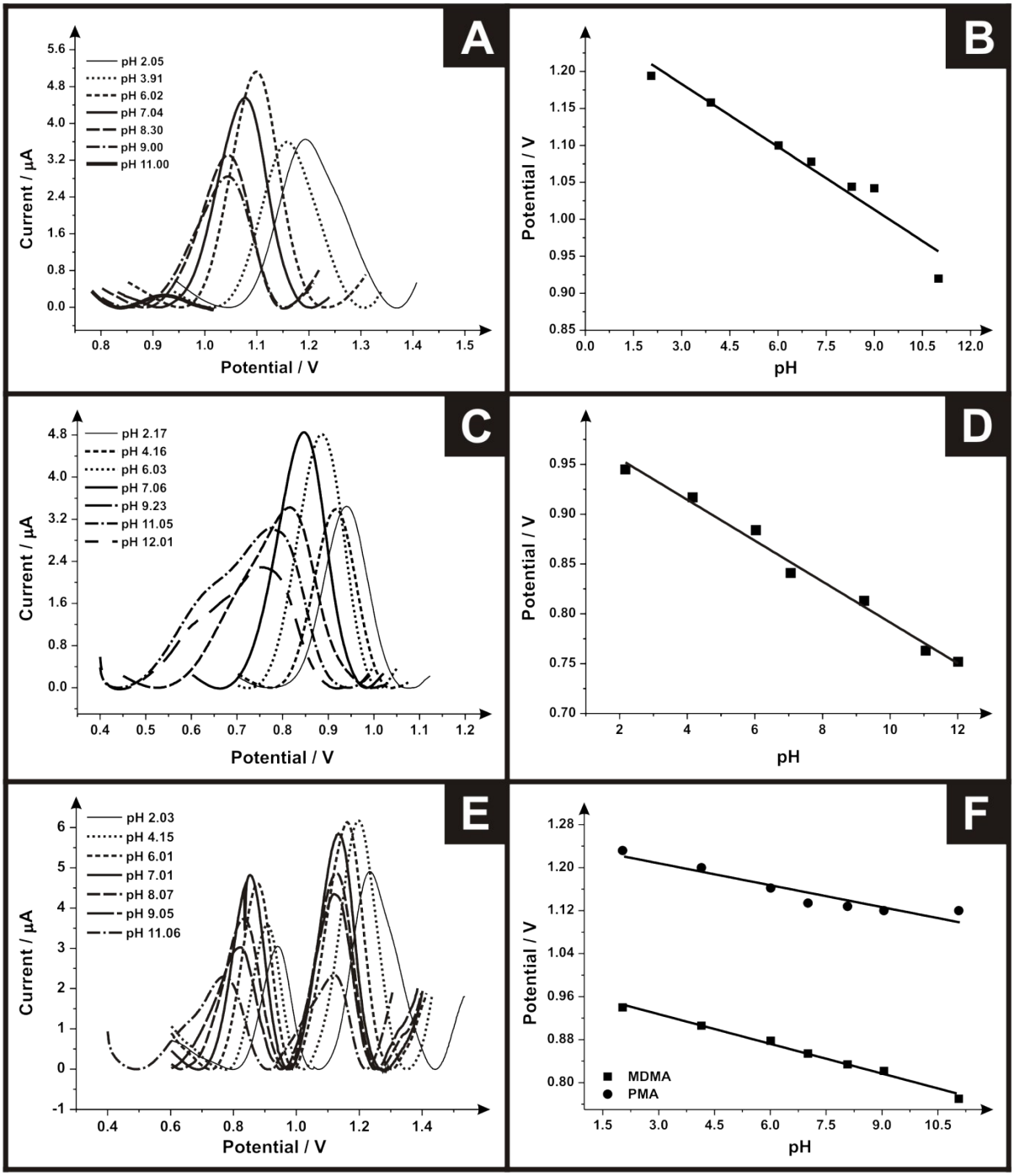
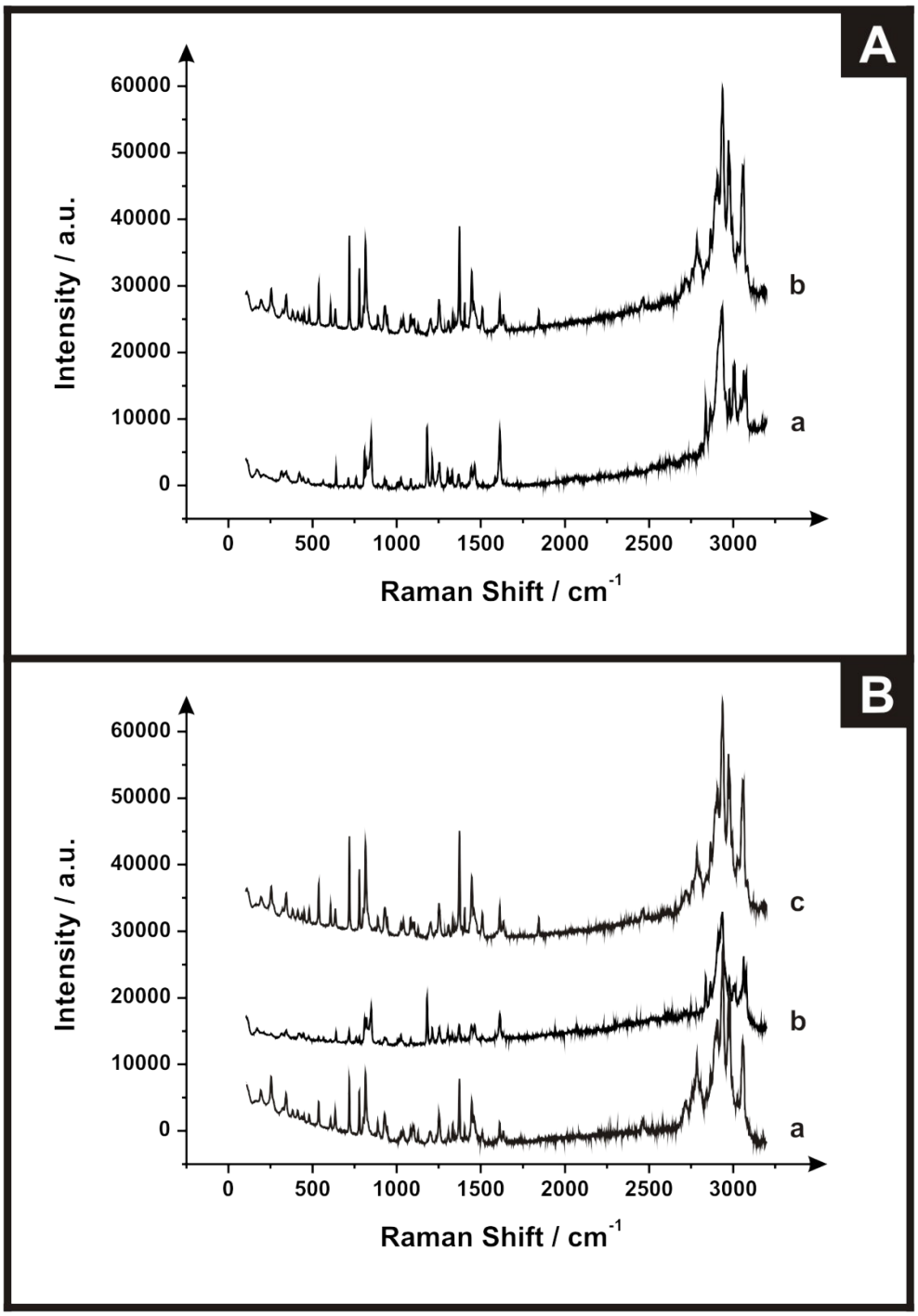


Figure SI-3.

Raman spectra of the **A:** (a) PMA and (b) MDMA and **B:** (a) 50% w/w of PMA + 50%w/w of MDMA, (b) 75%w/w of PMA + 25%w/w of MDMA and (c) 25%w/w of PMA + 75%w/w of MDMA.



Presumptive testing

Presumptive tests were carried out according to the United Nations recommended guidelines[1]. The following standard presumptive tests applied in this study: (i) Marquis; (ii) Mandelin; (iii) Simon's and (iv) Robadope test(s). The preparation of the reagents and test procedure is detailed below. Six repetitive tests of each compound were conducted and negative control samples were used in all tests. The ESI contains images of the spotting tiles (after 5 minutes). Test solutions containing 25:75% v/v; 50:50% v/v and 75:25% v/v (PMA:MDMA) were prepared by mixing appropriate volumes of solutions (10 mg mL^{-1}) of the reference standards in methanol.

Marquis Test: 1% formaldehyde (37% aqueous solution) in concentrated sulphuric acid (10 mL, d = 1.86). 1-2 drops each test sample in methanol (10 mg mL^{-1}) was placed into a dimple well of a white spotting tile and 2 drops of the test reagent added. Any colour change or other noticeable effect occurring immediately on addition of the reagents was noted and observations were made again after 5 min.

Mandelin Test: 1% ammonium metavanadate in concentrated sulphuric acid (10 mL, d = 1.86). 1-2 drops each test sample in methanol (10 mg mL^{-1}) was placed into a dimple well of a white spotting tile and 2 drops of the test reagent added. Any colour change or other noticeable effect occurring immediately on addition of the reagents was noted and observations were made again after 5 min.

Simon's Test: Reagent 1: 2% aqueous sodium carbonate solution (10 mL); Reagent 2: 1% aqueous sodium nitroprusside solution (10 mL); Reagent 3: 50% ethanolic acetaldehyde solution (10 mL). 1-2 drops each test sample in methanol (10 mg mL^{-1}) was placed into a dimple well of a white spotting tile and 2 drops of Reagents 1 - 3 was added sequentially with stirring after each addition. Any colour change or other noticeable effect occurring immediately on addition of the reagents was noted and observations were made again after 5 min.

Robadope Test: Reagent 1: 2% aqueous sodium carbonate solution (10 mL); Reagent 2: 1% aqueous sodium nitroprusside solution (10 mL); Reagent 3: 50% ethanolic acetone solution (10 mL). 1-2 drops each test sample in methanol (10 mg mL^{-1}) was placed into a dimple well of a

white spotting tile and 2 drops of Reagents 1 - 3 was added sequentially with stirring after each addition. Any colour change or other noticeable effect occurring immediately on addition of the reagents was noted and observations were made again after 5 min.

Figure SI-4.

Presumptive test results for (±)-4-methoxyamphetamine hydrochloride (PMA) and (±)-3,4-methylenedioxymethamphetamine hydrochloride (MDMA) after 5 minutes. Visualised under white light against negative control samples.

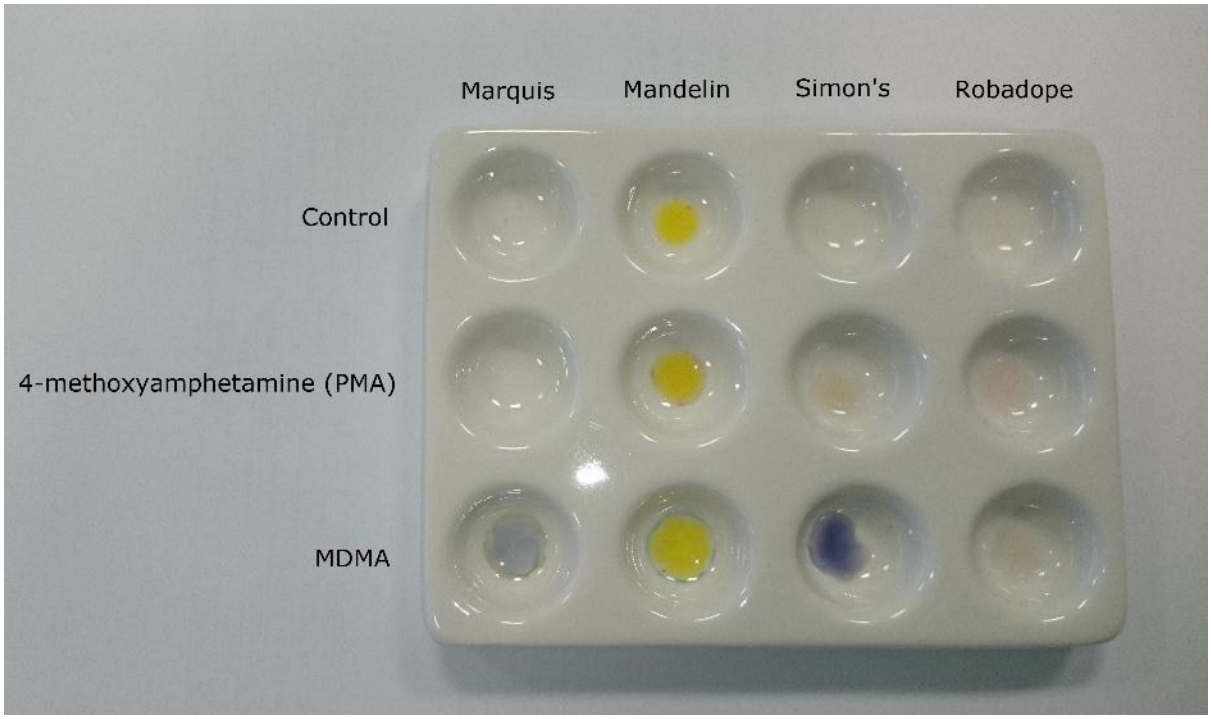
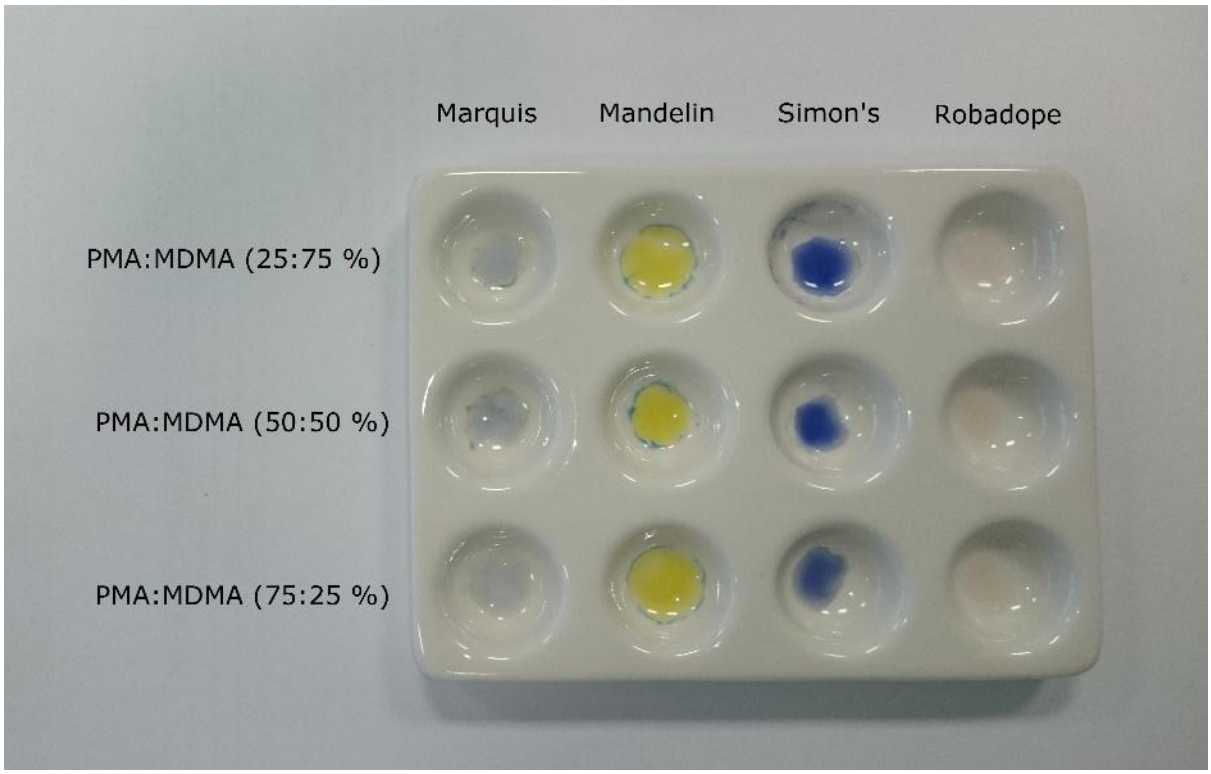


Figure SI-5.

Presumptive test results for mixtures of (±)-4-methoxyamphetamine hydrochloride (PMA) and (±)-3,4-methylenedioxymethamphetamine hydrochloride (MDMA) after 5 minutes. Visualised under white light.



References:

1. G. Nagy, I. Szollosi and K. Szendrei, Colour Tests for Precursor Chemicals of Amphetamine-Type Substances The Use of Colour Tests for Distinguishing between Ephedrine-Derivatives, http://www.unodc.org/pdf/scientific/SCITEC20-fin.pdf, Accessed 15/08/2015, 2015.