Supporting information

Anisotropic Molecular Ionization at 1 V from Tellurium Nanowires (Te NWs)

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Supporting information 1:

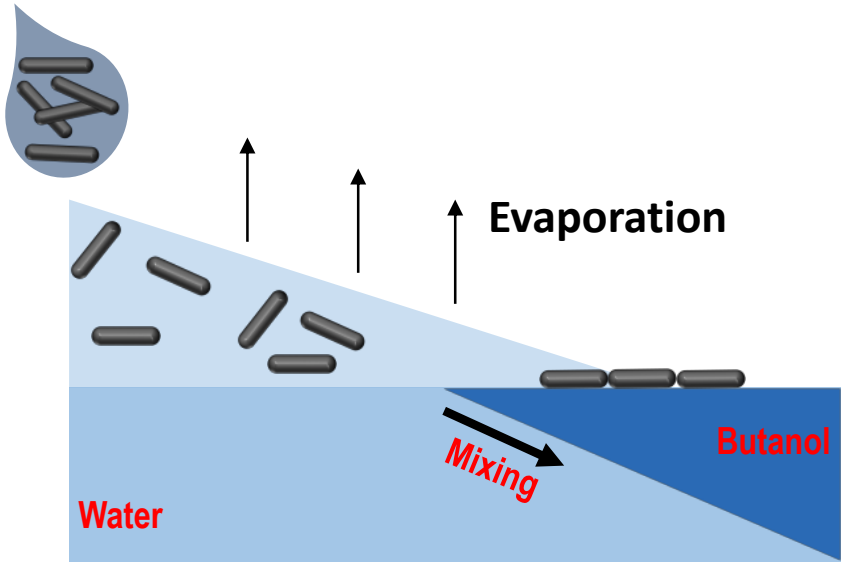


Figure S1. Schematic illustration of Te NWs alignment along water-butanol interface. Here Te NWs suspension was introduced to a petridish containing water with a micropipette. The capillary and buoyancy forces help the NWs to align along the interface. This can be easily transferred to a substrate under study. **Note that the alignment is side by side along the interface.**

Supporting information 2

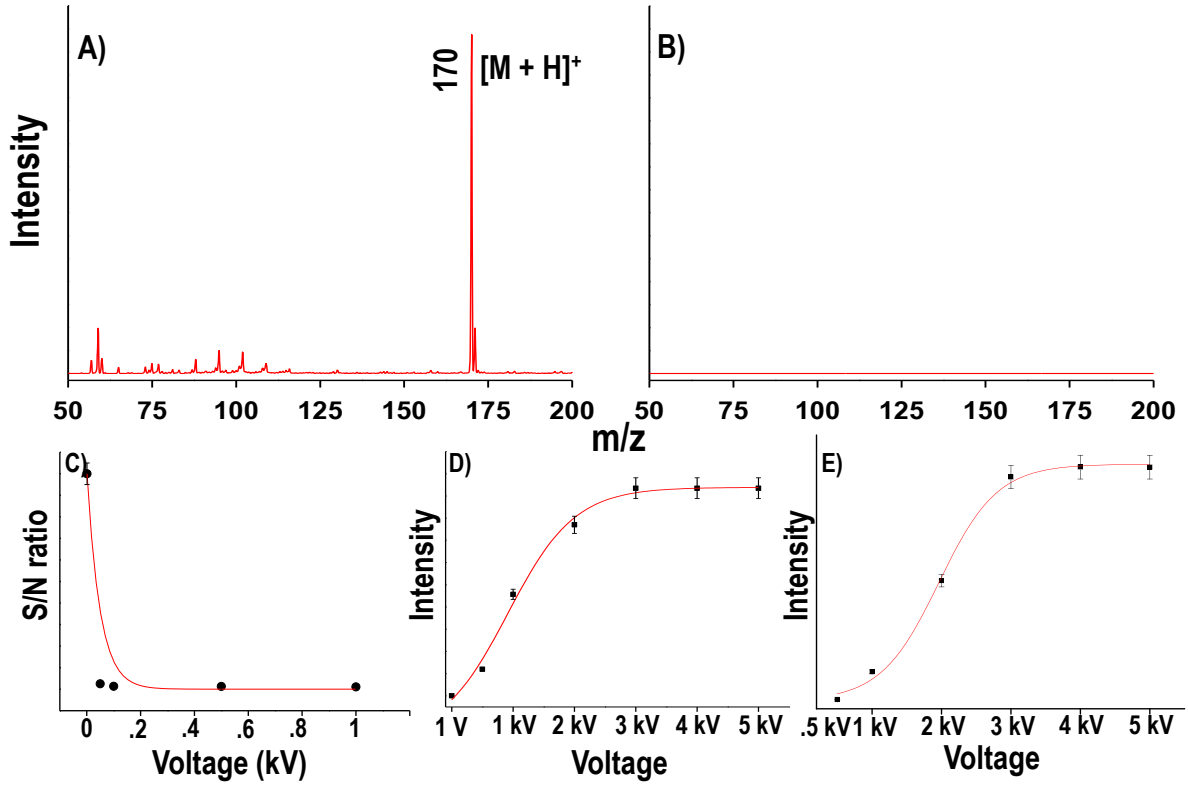


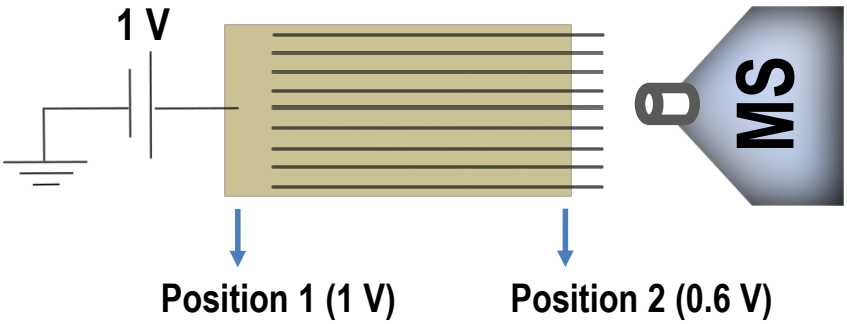
Figure S2. A) Mass spectrum of DPA from normal paper at 500 V, B) spectrum below an applied potential of 500 V, C) variation of S/N ratio with voltage for DPA, D) variation of signal intensity with voltage from a Te NW-coated paper, and E) variation of signal intensity with voltage from an ordinary Whatman filter paper. Parts D) and E) are separately normalized but the maximum ion currents are similar.

Supporting information 3:

Calculation of potential drop

Potential drop was determined manually by measuring the voltage at two positions using a multimeter. Potential at position 1 = 1 V, potential at position 2 = 0.6 V (with respect to the copper clip). So there is a decrease in potential of 0.4 V (1 - 0.6) across the paper due to paper and Te NWs resistances.

Here position 1 refers to paper edge which is near to copper clip and position 2 refers to edge near to MS inlet. This is shown in the schematic below.



Supporting information 4:

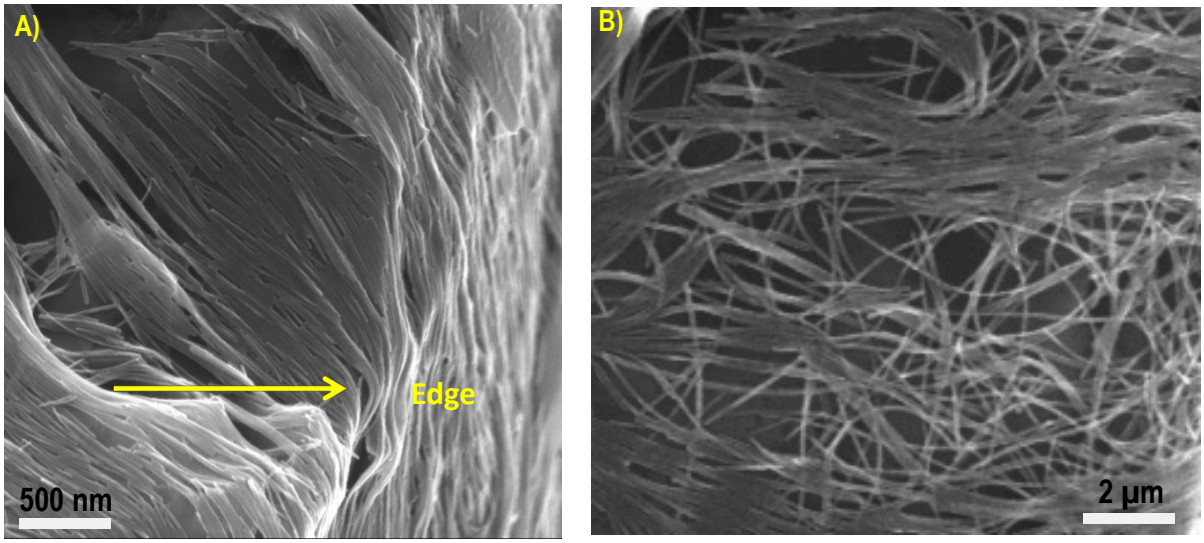


Figure S4. FE SEM image of A) position 5 and B) non-aligned NWs deposited on Si substrate.

Note: The deformation and discontinuity of NWs at position 5 edge is clearly visible in the image. Also there is bending of long NWs at the edge.

Supporting information 5:

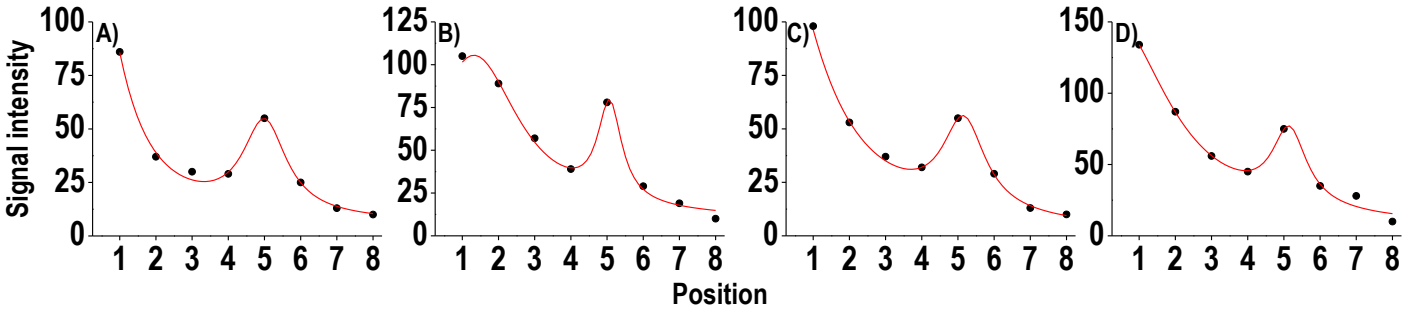


Figure S5. Anisotropic measurements done on multiple analytes with aligned Te NWs on silicon substrate, A) tributylphosphine, B) glutamine, C) alanine, and D) thymine.

Supporting information 6:

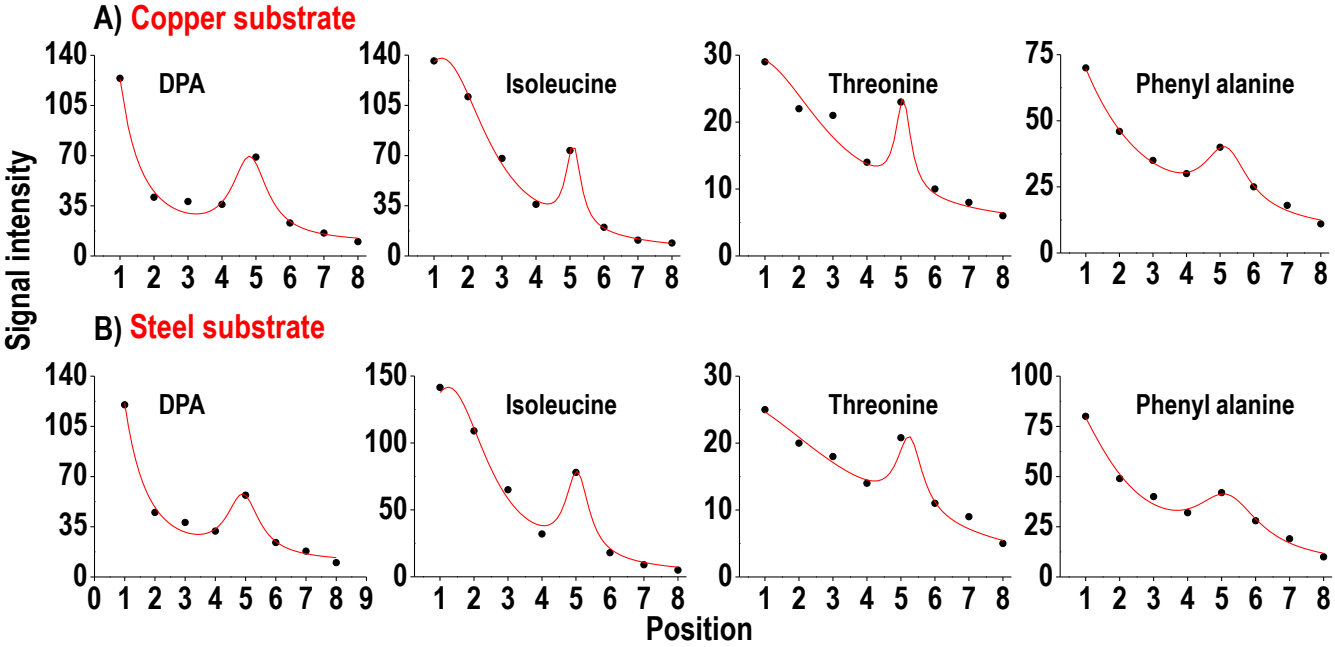


Figure S6. Anisotropic measurements done with aligned Te NWs on A) copper and B) steel substrates. Data with various analytes are shown.

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Supporting information 7:

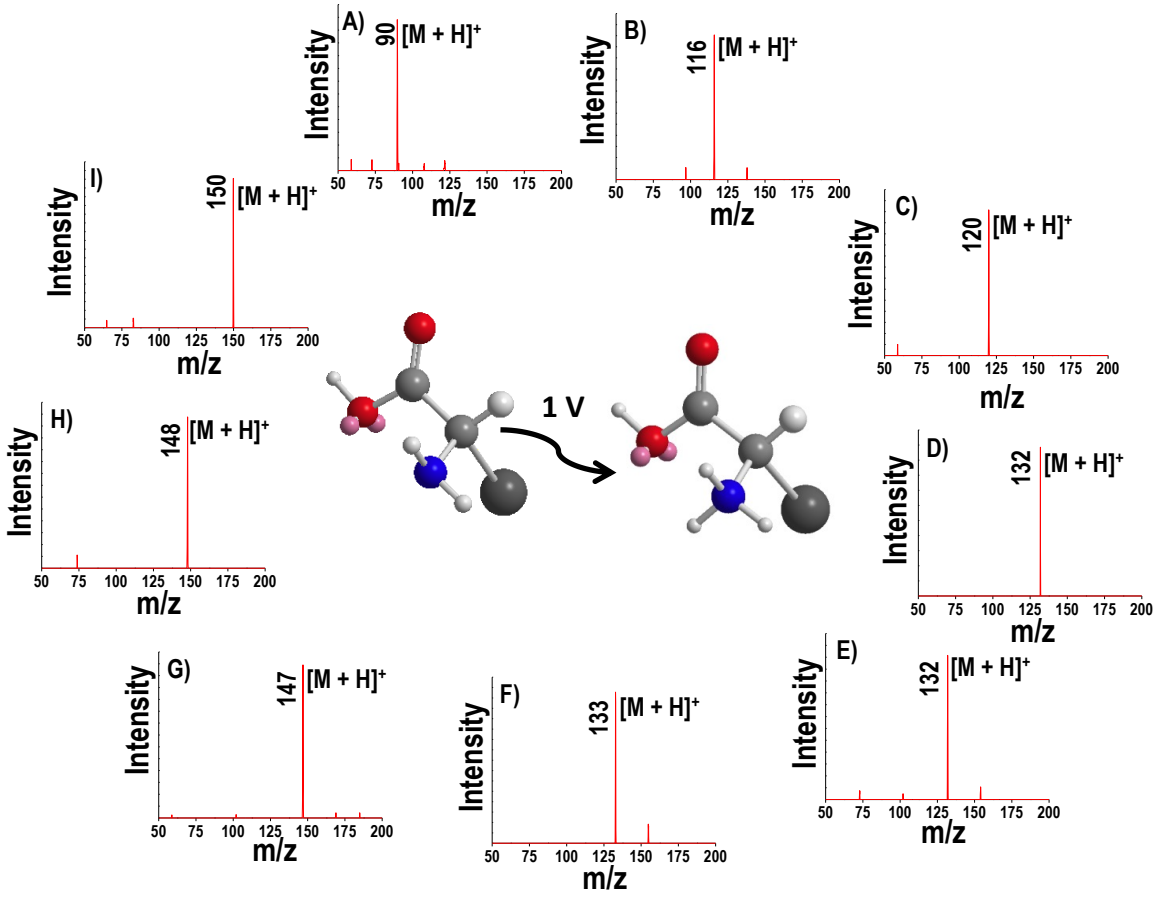

Figure S7. Mass spectra of various amino acids at 1 V using Tellurium nanowire-coated paper. A) Alanine, B) proline, C) threonine, D) isoleucine, E) leucine, F) aspargine, G) glutamine, H) glutamic acid and I) methionine.

Supporting information 8:

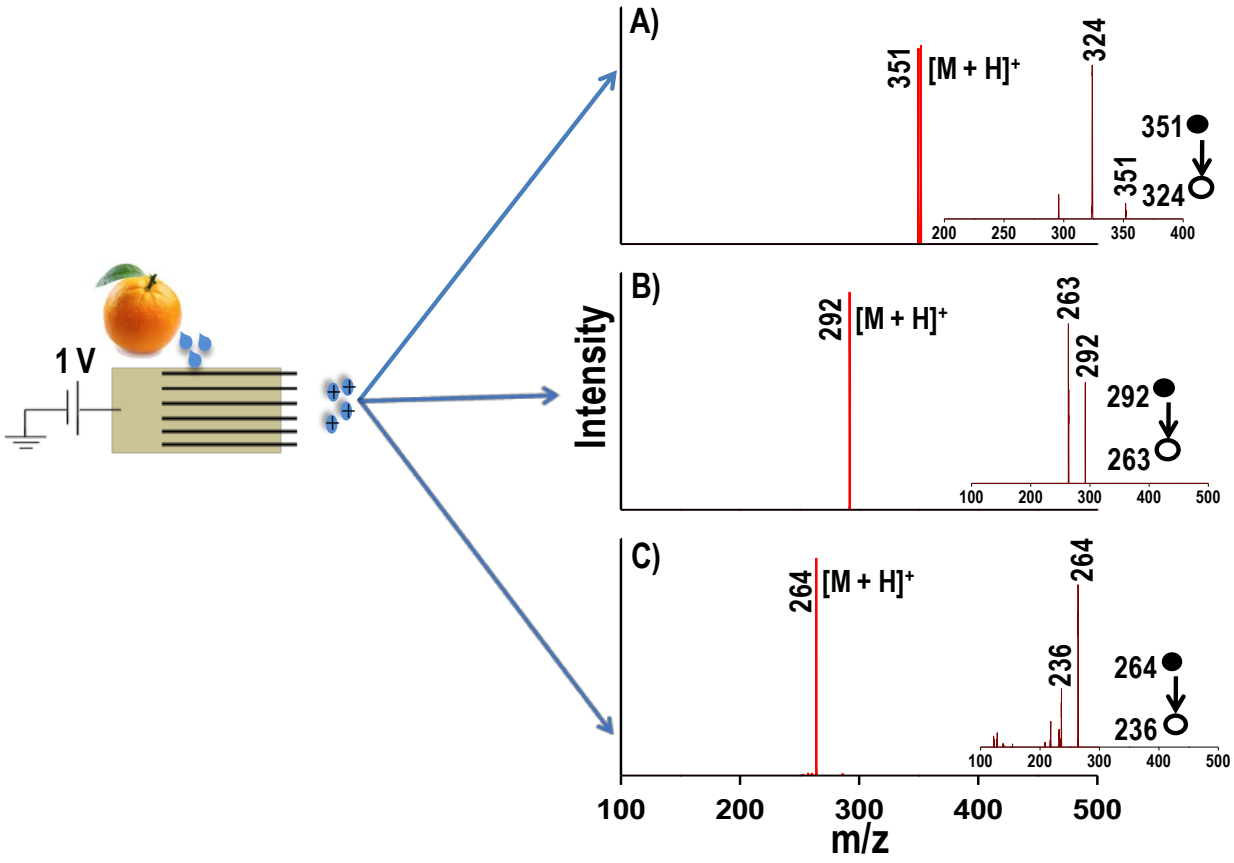

Figure S8. Detection of various pesticides from the surface of an orange at 1 V using tellurium nanowire-coated paper. A) Chloropyrifos, B) parathion and C) methylparathion. MS^2 data are given along with the mass spectra.

Table S1. Signal intensity of diphenylamine in different solvents at 1 V

No	Analyte system studied	m/z	Signal intensity
1	DPA in methanol	170	4.0×10^{-1}
2	DPA in ethanol	170	3.2×10^{-1}
3	DPA in propanol	170	2.5×10^{-2}
4	DPA in butanol	170	0

Table S2. Signal intensity of diphenylamine in butanol solutions of different conductivity recorded at 1 V.

No	Analyte system studied	m/z	Signal intensity
1	DPA (in butanol without sodium acetate)	170	0
2	DPA (Butanol with 1ppm sodium acetate)	170	0
3	DPA (Butanol with 10 ppm sodium acetate)	170	0
4	DPA (Butanol with 50 ppm sodium acetate)	170	0
5	DPA (Butanol with 100 ppm sodium acetate)	170	3.3×10^{1}
6	DPA (Butanol with 500 ppm sodium acetate)	170	1.70×10^{2}

Table S3. Signal intensity of DPA collected from positions 1 to 8 on a silicon substrate coated with aligned and non-aligned Te NWs. Positions are as in Figure 6.

Aligned Te NWs

No	Position	m/z	Signal intensity
A	1	170	1.12×10^2
B	2	170	3.58×10^1
C	3	170	3.57×10^1
D	4	170	3.13×10^1
E	5	170	5.69×10^1
F	6	170	2.19×10^1
G	7	170	1.77×10^1
h	8	170	1.11×10^1

Non-aligned Te NWs

No	Position	m/z	Signal intensity
A	1	170	2.84×10^1
B	2	170	2.83×10^1
C	3	170	2.86×10^1
D	4	170	2.82×10^1
E	5	170	2.82×10^1
F	6	170	2.81×10^1
G	7	170	2.87×10^1
h	8	170	2.87×10^1

Table S4. Effects of orientation, voltage and pH on protonated molecule signal intensity.

Compound	**Direction**	**Voltage**	**pH**	**Signal**	**Direction**	**Voltage**	**pH**	**Signal**
DPA, m/z 170	Parallel	1 V	neutral	53	Orthogonal	1 V	Neutral	0.7
"	"	0 V	neutral	6	"	0 V	Neutral	0.4
DPA, m/z 170	Parallel	1 V	14	0	Orthogonal	1 V	14	0
"	"	1 V	9	0	"	1 V	9	0
"	"	1 V	7	9	"	1 V	7	0
"	"	1 V	2	10	"	1 V	2	2
"	"	0 V	14	0	"	0 V	14	0
"	"	0 V	9	0	"	0 V	9	0
"	"	0 V	7	2	"	0 V	7	0
"	"	0 V	2	6	"	0 V	2	0.5
Compound	**Direction**	**Voltage**	**pH**	**Signal**	**Direction**	**Voltage**	**pH**	**Signal**
Thymine, m/z 126	Parallel	1 V	7	0	Orthogonal	1 V	7	0
"	"	1 V	2	1	"	1 V	2	3

“	“	0 V	7	0	“	0 V	7	0
“	“	0 V	2	2	“	0 V	2	0
Adenine, m/z 136	“	1 V	7	8	“	1 V	7	0.6
“	“	1 V	2	2	“	1 V	2	1
“	“	0 V	7	5	“	0 V	7	2
“	“	0 V	2	1	“	0 V	2	0.7
Guanine, m/z 152	“	1 V	7	0	“	1 V	7	0
“	“	1 V	2	2	“	1 V	2	0
“	“	0 V	7	0	“	0 V	7	0
“	“	0 V	2	0	“	0 V	2	0

Note: The data show that signals are detected at 0 V as well in cases where ions exist in solution**.**

Table S5. Signal intensity of various tablets at 1 V.

NO	Tablet studied	m/z	Signal intensity
2	Diethylcarbamazine (DIET pills)	200	1.37×10^2
3	Trimetazidine (flavdon tablets)	267	1.80×10^2
4	Clopidogrel (from clopidogrel tablets)	322	2.90×10^2
5	Gliclazide (gliclazide tablets)	324	2.85×10^2
6	Levocetricine (xysal tablets)	389	3.25×10^2