

What is claimed is:

1. A method of detecting an organophosphorus compound (OPC) and/or an illicit drug with an ion detector, the method comprising the steps of:
forming a proton-bound adduct ion between at least one OPC and at least one secondary or tertiary amine in a reaction region defined between an ionization source and the ion detector; and
detecting the proton-bound adduct ion with the ion detector to confirm presence of the OPC and/or the illicit drug.
2. The method of Claim 1 wherein the at least one secondary or tertiary amine includes a proton affinity greater than the organophosphorus compound ion.
3. The method of any of the preceding claims, wherein the at least one secondary or tertiary amine includes a proton affinity between 220 kcal/mol and 250 kcal/mol.
4. The method of any of the preceding claims wherein the at least one OPC is an analyte and the at least one secondary or tertiary amine is a dopant.
5. The method of Claim 4 wherein the OPC is a phosphonate or an organophosphate.
6. The method of Claim 4 wherein the dopant is a dialkylamine, alkyl-substituted derivative of pyridine, or a trialkylamine.
7. The method of Claim 6 wherein the dialkylamine or trialkylamine have R groups with between 1 and 12 carbons including: diethylamine, diisopropyl amine, diethylmethyl amine, triethylamine, tripropylamine, tributylamine, trioctylamine, tridecylamine, tridodecylamine, and combinations thereof.
8. The method of Claim 6 wherein the OPC is detectable at 100 parts-per-quadrillion or better.
9. The method of Claim 1 wherein the illicit drug is an analyte and the at least one OPC is a dopant.

10. The method of any of the preceding claims wherein the OPC is a phosphonate or an organophosphate.
11. The method of any of the preceding claims wherein the illicit drug includes at least one of: heroin, cocaine, and methamphetamine.
12. The method of any of the preceding claims wherein the illicit drug is detectable at 160 parts-per-quadrillion or better.
13. The method of any of the preceding claims wherein the ion detector is a mass spectrometer or an ion mobility spectrometer.
14. The method of any of the preceding claims, further including ionizing a vapor sample comprising the at least one secondary or tertiary amine and/or the at least one OPC therein with the ionization source, wherein the at least one secondary or tertiary amine has a proton affinity greater than or equal to about 220 kcal/mol.
15. A method of detecting an organophosphorus compound (OPC) and/or an illicit drug with an ion detector, the method comprising the steps of:
 - ionizing a vapor sample with an ionization source, the vapor sample containing at least one OPC and at least one secondary or tertiary amine;
 - introducing the ionized vapor sample containing the at least one OPC and at least one secondary or tertiary amine therein into a reaction region defined between the ionization source and the ion detector;
 - forming at least one proton-bound adduct ion between the OPC and the at least one secondary or tertiary amine therein; and
 - detecting the at least one proton-bound adduct ion with the ion detector to confirm presence of the OPC and/or the illicit drug in the vapor sample.
16. The method of Claim 15 wherein the at least one secondary or tertiary amine has a proton affinity greater than the organophosphorus compound ion.
17. The method of Claim 15 wherein the at least one secondary or tertiary amine has a proton affinity between 220 kcal/mol and 250 kcal/mol.

18. The method of Claim 15 wherein the at least one OPC is an analyte and the at least one secondary or tertiary amine is a dopant.
19. The method of Claim 18 wherein the dopant is a dialkylamine, alkyl-substituted derivative of pyridine, or a trialkylamine.
20. The method of Claim 18 wherein the dialkylamine or trialkylamine have R groups with between 1 and 12 carbons including: diethylamine, diisopropyl amine, diethylmethyl amine, triethylamine, tripropylamine, tributylamine, trioctylamine, tridecylamine, tridodecylamine, and combinations thereof.
21. The method of Claim 15 wherein the OPC is detectable at 100 parts-per-quadrillion or better.
22. The method of Claim 15 wherein the at least one secondary or tertiary amine is an illicit drug and the at least one OPC is a dopant.
23. The method of Claim 22 wherein the illicit drug is detectable at or greater than 160 parts-per-quadrillion.
24. The method of Claim 15 wherein the ion detector is a mass spectrometer or an ion mobility spectrometer.