THE CLAIMS

What is claimed is:

1. A beam-line ion implantation, plasma immersion ion implantation or plasma doping system, comprising a source of a boron-containing compound comprising two or more boron atoms and at least one fluorine atom, wherein the compound contains a boron isotope in a concentration or ratio greater than a natural abundance concentration or ratio thereof.

2. The system of claim **1**, comprising a conduit adapted for delivery of the compound to an ionization chamber, wherein the conduit is maintained at a temperature effective to suppress clogging of the conduit and/or decomposition of the compound in the conduit, optionally wherein at least one of the conduit and an ionization chamber of the system is actively cooled.

3. A gas storage and dispensing vessel holding a boron-containing compound comprising two or more boron atoms and at least one fluorine atom, wherein the compound contains a boron isotope in a concentration or ratio greater than a natural abundance concentration or ratio thereof.

4. A method of improving beam current for an ion implantation process, comprising: flowing a boron-containing compound comprising two or more boron atoms and at least one fluorine atom, wherein the compound contains a boron isotope in a concentration or ratio greater than a natural abundance concentration or ratio thereof; and generating an ion beam from the compound.

5. A method of synthesizing a boron-containing compound comprising two or more boron atoms and at least one fluorine atom, wherein the compound contains a boron isotope in a concentration or ratio greater than a natural abundance concentration or ratio thereof, comprising contacting a boron-containing gas with a boron-containing solid, wherein at least one of the boron-containing gas and boron-containing solid is isotopically-enriched beyond a natural abundance in atomic mass 10 boron isotope or in atomic mass 11 boron isotope.

6. The method of claim **5**, wherein the compound is B_2F_4 and the boron-containing gas is BF_3.

7. An ion implantation method, comprising flowing a a boron-containing compound comprising two or more boron atoms and at least one fluorine atom, wherein the compound contains a boron isotope in a concentration or ratio greater than a natural abundance concentration or ratio thereof, to an ion implantation tool with at least one co-flowed species selected from the group consisting of inert gas, argon, nitrogen, helium, hydrogen, ammonia, xenon, xenon difluoride, isotopically-enriched diborane, and natural abundance diborane.

8. An ion implantation method, comprising flowing B_2F_4 isotopically enriched in atomic mass 11 boron, to an ion implantation tool with BF_3 isotopically enriched in atomic mass 11 boron.

9. An ionized composition useful for AMU separation to generate ionic species for ion implantation, said composition deriving from a boron precursor compound comprising two or more boron atoms and at least one fluorine atom, wherein the compound contains a boron isotope in a concentration or ratio greater than a natural abundance concentration or ratio thereof, wherein said boron precursor compound is isotopically enriched beyond natural abundance of ^{10}B or ^{11}B, and wherein said composition comprises one or more species selected from the group consisting of $B_2F_4^+$, $B_2F_3^+$, $B_2F_2^+$, BF_3^+, BF_2+, BF^+, B^+, F^+, B_2F_4++, B_2F_3++, B_2F_2++, BF_3++, BF_2^{++}, BF^{++}, B^{++}, F^{++}, $B_2F_4^{+++}$, $B_2F_3^{+++}$, $B_2F_2^{+++}$, BF_3^{+++}, BF_2^{+++}, BF^{+++}, B^{+++}, and F^{+++}, the boron-containing ones of which are isotopically-enriched beyond natural abundance of ^{10}B or ^{11}B.

10. A method of improving beam current for an ion implantation process, comprising ionizing an isotopically-enriched, boron-containing compound comprising two or more boron atoms and at least one fluorine atom, wherein the compound contains a boron isotope in a concentration or ratio greater than a natural abundance concentration or ratio thereof, to form isotopically-enriched ionic species producing such improved beam current, in relation to a corresponding non-isotopically-enriched, boron-containing compound.