HYDROGENATED ISOTOPICALLY ENRICHED BORON TRIFLUORIDE DOPANT SOURCE GAS COMPOSITION

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims the benefit of U.S. Provisional Application No. 62/314241, filed on March 28, 2016 entitled "Hydrogenated Isotopically Enriched BF3 Dopant Source Gas Composition", the contents of which are incorporated herein by reference in its entirety for all purposes.

TECHNICAL FIELD

[0002] The disclosure relates to a hydrogenated isotopically enriched boron trifluoride (BF_3) dopant source gas composition for use in ion implantation, and to associated methods and apparatus.

BACKGROUND

[0003] Ion implantation is used in integrated circuit fabrication to accurately introduce controlled amounts of dopant impurities into semiconductor wafers during the manufacture of microelectronic/semiconductor manufacturing. In such implantation systems, an ion source ionizes a desired dopant element gas, and the ions are extracted from the source in the form of an ion beam of desired energy. Extraction is achieved by applying a high voltage across suitably-shaped extraction electrodes, which incorporate apertures for passage of the extracted beam. The ion beam is then directed at the surface of a workpiece, such as a semiconductor wafer, to implant the dopant elements into the workpiece. The ions of the beam penetrate the surface of the workpiece to form a region of desired conductivity.

[0004] Several types of ion sources are used in ion implantation systems, including the Freeman and Bernas types that employ thermoelectrodes and are powered by an electric arc, microwave types using a magnetron, indirectly heated cathode (IHC) sources, and RF plasma sources, all of which typically operate in a vacuum. In any system, the ion source generates ions by introducing electrons into a vacuum arc chamber (hereinafter "chamber") filled with the dopant gas (commonly referred to as the "feedstock gas"). Collisions of the electrons with atoms and molecules in the dopant gas result in the creation of ionized plasma consisting of positive and negative dopant ions. An extraction electrode with a negative or positive bias will respectively