

Sol-gel method preparation of thin solid films as source of B and Sb diffusion dopants for silicon electronic engineering

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Advances in micro- and nanoelectronics demand a progressive development of integrated circuits technology created with new methods to attain high functional features. Integrated circuits production includes both thin and thick films composed from various compounds. A method of silicon doping through deposition of the sol-gel derived silica with dopants of III and V groups of the periodic system is challenged among many different other methods as efficient, flexible and low-cost technique, especially for films with complicated composition. Diffusion from the films deposited onto silicon can be done by one or several dopants, and it is well combined with existing silicon industry. In present work, we have developed the sol-gel technique for doping B and Sb through incorporation of B- and Sb-compounds into precursor sol followed by deposition of glassy films onto silicon wafers. Homogeneous and transparent films of thickness in the range 0.2 – 2 μm were produced after the heat treatment at 5000° in air with good adhesion to the surface of glasses and silicon wafers. Diffusion of the dopants was stimulated by heating. Usage of the both types of dopants allows us to fabricate p-n layers in silicon. The films were removed completely from silicon surface using a series of standard etching agents. Dielectric properties of the films were controlled within the operations used, and the final resistance of silicon was in the range 7 – 90 Ohm/sq.

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