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High resistivity, nitrogen-enriched FZ Si wafers for particle detectors

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We present the properties of the first high-resistivity, nitrogen enriched FZ Si wafers produced within the framework of the NitroSil project. The n-type wafers of 100 mm in diameter were prepared from the high-purity FZ Si crystals grown in <100> direction. The nitrogen doping was performed during the crystals growth and the doping with phosphorus was made by the neutron transmutation process (NTD) that is a unique technique enabling
a strictly controlled and uniform distribution of phosphorus in Si single crystals to be achieved. In order to remove the radiation damage and to obtain the target resistivity, after the NTD processes the crystals were subjected to a heat treatment. The nitrogen rich wafers are characterized by: ρ ≈ 2000 Ωcm, [N] ≈ 1.5E15 cmˆ-3, [O] < 1E16 cmˆ-3, and [C] < 5E15 cmˆ-3. The radial resistivity distributions of N-free and N-rich wafers are compared. The availability of the N-rich wafers on the market of semiconductor materials for particle detectors is discussed.

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