

# Application of charged particle activation analysis at the Nishina Memorial Cyclotron Center, JRIA -- Determination of nitrogen in silicon --

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## Abstract

Charged-particle activation analysis (CPAA) has been used for the determination of light elements in various high purity materials without the effect of its chemical state and the contamination caused by atmosphere. In this work, CPAA of trace amount of nitrogen in silicon has been tried at Nishina Memorial Cyclotron Center, JRIA. A new irradiation chamber was designed for CPAA. The irradiation and current monitoring were performed successfully. Silicon samples were bombarded with 15 MeV proton for 10 min and the  $^{14}\text{N}(p, \alpha)^{11}\text{C}$  reaction was used for determination. After irradiation, samples were decomposed with NaOH and oxidized with  $\text{KMnO}_4$ . Radioactive carbon was separated as  $\text{CO}_2$  and precipitated as lithium carbonate. The annihilation gamma-ray radiated after positron emission from  $^{11}\text{C}$  of lithium carbonate was detected with a couple of 3 inch BGO-scintillation detectors and a coincidence counting system. The detection limit of nitrogen was below  $1\text{E}14 / \text{cm}^3$ . Nitrogen in CZ and FZ type silicon sample has been successfully determined and data were good agreement with the data obtained by SIMS. We will continue this work to obtain the suitable conditions of irradiation, etching, separation and