

Suitable test structures for submicron ion beam analysis

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For the precise determination of the sizes of submicron beam spots test structures with an excellent edge definition are required. For this purpose a semiconductor heterostructure consisting of an $1.62 \mu\text{m}$ GaInP epi-layer grown on (0 0 1) GaAs has been made, which provides atomically sharp edges for beam spot size measurements. Since the sample has been thinned down by standard transmission electron microscope (TEM) preparation techniques, it can be used for both PIXE and STIM. The sample has been investigated with a TEM and the ion nanoprobe LIPSION. A one-dimensional beam profile in the low current mode was determined by a STIM measurement using 2 MeV protons and yielded a FWHM of $(41 \pm 4) \text{ nm}$, which is the smallest value reported so far for high energy nuclear micro- and nanoprobe. Furthermore we present nickel nanowhiskers produced at the GSI Darmstadt by electrochemical preparation of etched ion track membranes that have been used to obtain two-dimensional images of the shapes of submicron beam spots. For these measurements a scan over a single nickel nanowhisker having a diameter of 220 nm and a height of about $6 \mu\text{m}$ was performed.