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**EBIC MEASUREMENT OF BULK AND SURFACE RECOMBINATION IN P-TYPE SILICON :
INFLUENCE OF OXIDATION AND HYDROGENATION**

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Effect of oxygen and hydrogen was studied in both single-crystal and solar-grade polycrystalline p-type silicon.

The variation of EBIC collection efficiency versus voltage was used to characterize both the local minority carrier diffusion length and the surface electrical activity [1].

Preliminary experiments were made to check the effect of different polishing processes. It was found that industrial basic liquids diminished the diffusion length. Best results were obtained by standard diamond polishing followed or not by copper nitrate mechano-chemical polishing. Final preparation with HF, HNO₃, CH₃COOH mixing was used in all cases.

Hydrogen was introduced by low energy plasma [2] and oxygen by surface oxidation at 1000°C in dry O₂. The oxide film was removed with HF before deposit of the Schottky contact (Al thermal evaporation). Hydrogen and oxygen SIMS profiling and SIMS calibration gave the hydrogen and oxygen concentrations.

The collection efficiency at low beam voltage was enhanced by hydrogenation, indicating passivation of surface states. However the images of the hydrogenated samples showed dark zones indicating that surface was damaged during plasma treatment [3]. No EBIC could be obtained from oxidized samples. Plasma hydrogenation of these samples restored collection efficiency up to what was obtained in unoxidized hydrogenated samples.

Further experiments are in progress to understand oxygen and hydrogen influence on silicon near-surface electrical activity.

[1] : N. TABET and R.-J. TARENTO, to be published in Phil. Mag.

[2] : D. BALLUTAUD, G. MOULIN and M. AUCOUTURIER, Surf. Sci. **178**, 70 (1986)

[3] : N. M. JOHNSON, F. A. PONCE, R. A. STREET and R. H. NEMANICH, Phys.Rev. **B35**, 4166(1987).

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