

Quantitative analysis of BPSG on silicon

This application shows the ability to quantify depth profile analysis made with an RF source.

The sample is a BPSG (Boron Phosphorous Silicon Glass) film on a Silicon wafer. This kind of film is used in the manufacturing of many different semi-conductors.

The analysis has been achieved with a 4 mm diameter anode. The analytical parameters have been chosen in order to obtain a good depth resolution. The RF power was of 40 Watts the Argon pressure in the discharge

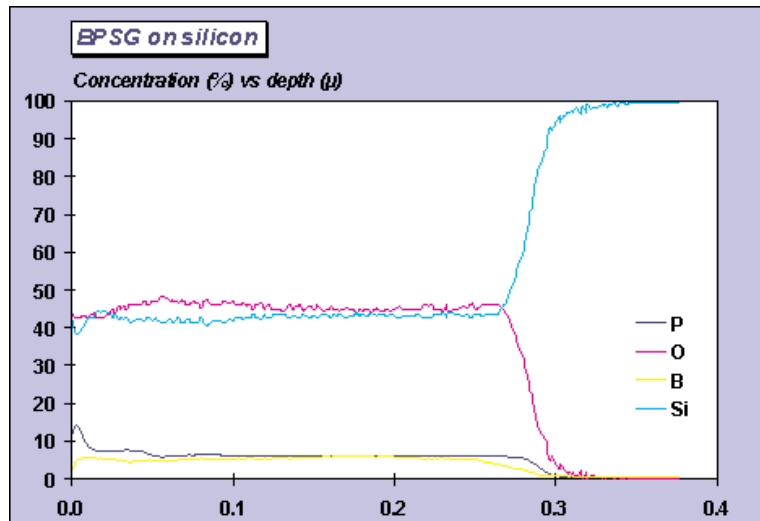
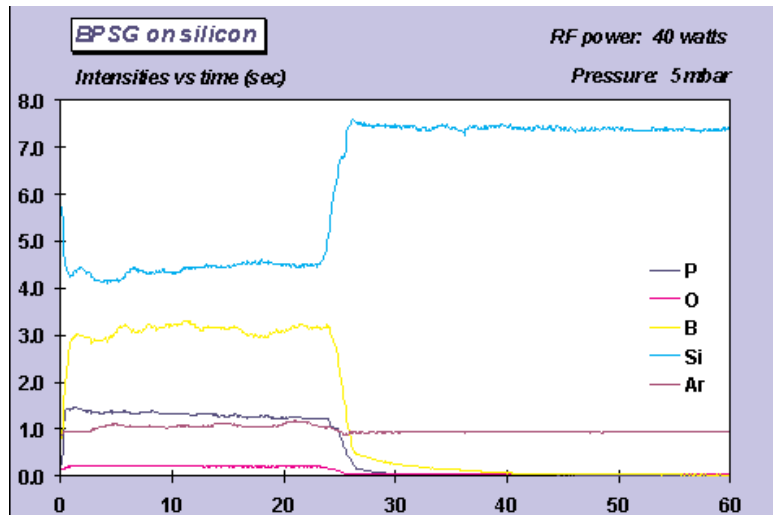
cavity of about 5 mbar. The sample is introduced with an autoloading system specially designed for the handling of 6 and 8 inch wafers.

The quantitative computation needs a previous calibration for all elements which is achieved from several standards (pure Silicon, pure SiO₂ film and different BPSG with a different concentration of Boron and Phosphorous). This calibration takes in account the sputtering rates of the standards and their specific gravity. The results are given in % weight but can be easily converted to atomic percent.

QUALITATIVE ANALYSIS

The qualitative analysis leads to a diagram Intensity (arbitrary unit) vs time (sec).

Already the raw intensities give a good idea of the element distribution within the BPSG film. The sputtering rate for the given excitation conditions is of 0.8 μm/min. The complete analysis is performed in one minute.



QUANTITATIVE ANALYSIS

The algorithm of the new QUANTUM software, especially developed for the RF source, allows to convert the previous diagram to a Quantitative depth profile : % elements vs depth (μm).

In this case, the BPSG film is 300 nm thick. A small enrichment of Phosphorous can be observed at the extreme surface.