

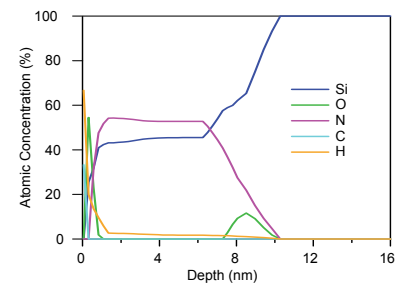
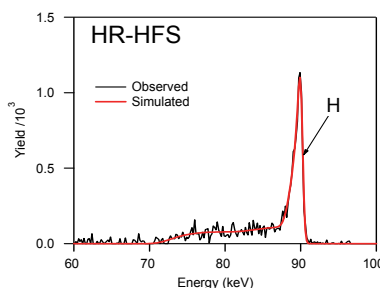
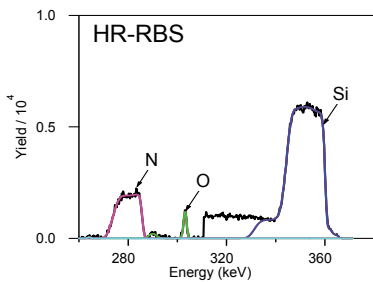
SiN depth profile using ion scattering

Using ion scattering, as typified by RBS, depth profile can be acquired for thin films with various thickness, from ultrathin to thick films. High accurate composition including hydrogen can be obtained. Here depth profile of ultrathin SiN film, and RBS / HFS / NRA combination analysis of SiN film including carbon are presented below.

Ultrathin SiN film : HR-RBS / HR-HFS

Sample : SiN(8nm) / Si-sub.

Accurate depth profile, with approx. 1nm depth resolution, can be provided by High resolution RBS / HFS (HR-RBS / HR-HFS).



HR-RBS / HR-HFS spectra of ultrathin SiN film

Depth profile

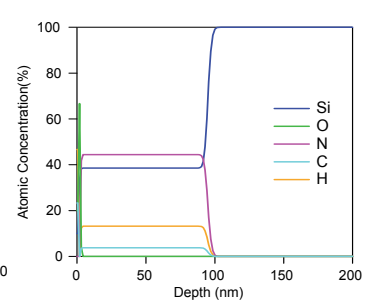
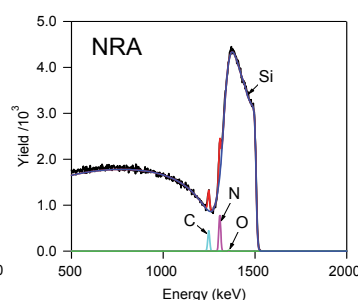
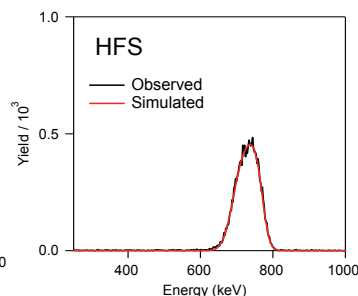
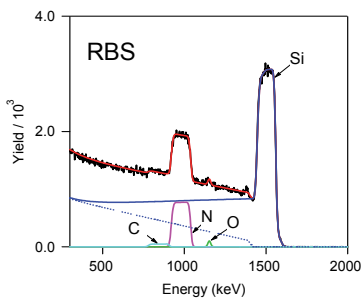
| region [nm] | atomic% | | | density [g/cm ³] |
|-------------|---------|------|-----|------------------------------|
| | Si | N | H | |
| 1.6~5.7 | 44.9 | 53.1 | 2.0 | 2.58 |

- Composition without the effect of surface / interface oxide
- Depth resolution : approx. 1nm
- Film density can be calculated (film thickness needed)

SiN including C : RBS / HFS / NRA

Sample : SiN(94nm) / Si-sub.

For light elements below the detection limit of RBS, it is useful to add NRA analysis. With the help of NRA, precision and detection limit can be drastically improved.



RBS / HFS / NRA spectra of C including SiN

Depth profile

| region [nm] | atomic% | | | | density [g/cm ³] |
|-------------|---------|------|------|-----|------------------------------|
| | Si | N | H | C | |
| 1.7~92.3 | 38.6 | 44.4 | 13.2 | 3.8 | 2.31 |

- Accurate composition including low concentration light elements
- Detection limit of C
RBS : 5 at.%, NRA : 0.2 at.%