

CASE STUDY

Deep Oxide Etch for HSI Filters

Customer

Imec is a world-leading R&D and innovation hub in nanoelectronics and digital technologies. As a trusted partner for companies, startups and academia they aim to bring together brilliant minds from all over the world in a creative and stimulating environment. See www.imec-int.com

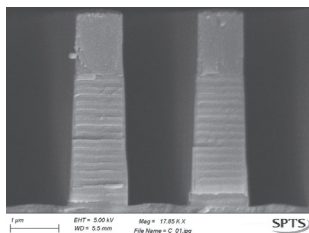
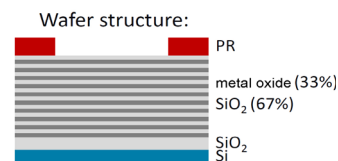
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Application

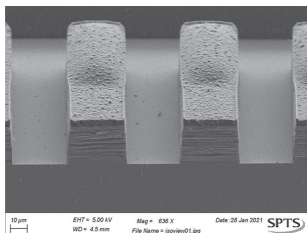
Hyperspectral imaging is a method used to scan objects and collect/analyze the reflected light across the electromagnetic spectrum, not purely the visible bands. High definition images can be obtained and used to distinguish objects and identify materials in areas including agriculture, manufacturing, biology, biomedical imaging and geosciences.

Background

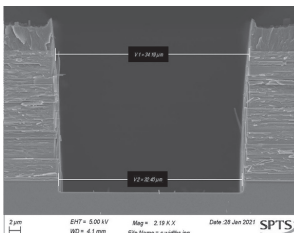
Imec have developed on-chip technology which makes hyperspectral imaging real-time, compact and scalable. Spectral filters, tailored to the needs of the end-user, can be manufactured directly onto the image sensor pixels at the wafer level. These spectral filters include thick stacks of alternating materials with high and low refractive index on a silicon or quartz wafer. Trench features between 3µm and 20µm deep were required, etched through the filter stack. Due to the low volatility of the layers, SPTS recommended their Synapse™ etch technology for this application, with its high ion density to ensure a productive etch rate and directionality.



2.7µm deep trench through filter stack on quartz wafer



22µm deep trenches through SiO₂-metal oxide filter stack on Si wafer



As well as etch depth and sidewall profile, other factors such as good cross-wafer uniformity and end-point control were important to ensure imec could develop a production-worthy manufacturing route with high yields.

OBJECTIVE

- Etch features of depths between 3-20µm into stacks with metal oxides
- Productive etch rate >330nm/min
- Cross-wafer uniformity <±5%
- Good selectivity to PR mask
- >70° profile

SOLUTION

- Use a Synapse module to achieve desired features in the metal oxide stacks
- Control the process using end-point

RESULTS

- SPTS demonstrated a successful etch process for trench depths up to 22µm, meeting all desired specifications.
- imec purchased a Synapse™ system to enable further process improvements and filter developments

"Last year in imec, we were struggling to enable new projects using complex filter stacks. So we initiated a demo with SPTS on their Synapse module for thick filter stack etches. The SPTS Process Team found a working process and provided excellent results summary, and we are now ready to start filter stack etch in the newly installed Synapse chamber in imec" Reda Boufadil, imec Area Manager for Dry Etch.