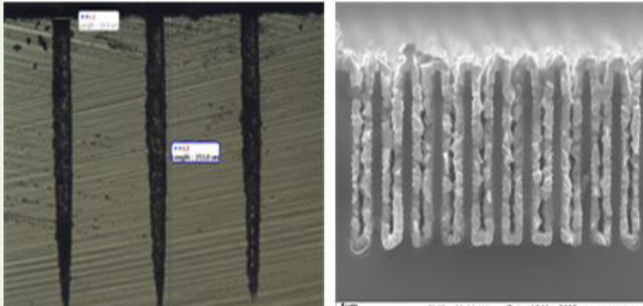


## APPLICATIONS

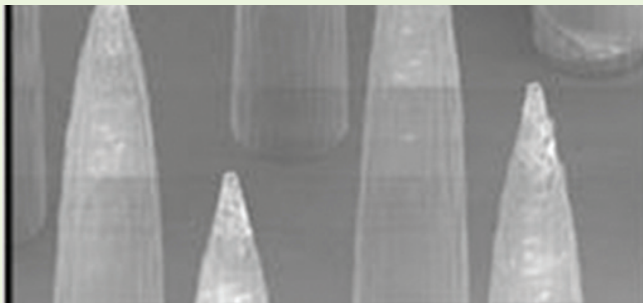
- Space Technologies: FSS design and fabrication
- Medical and Biosensor.
- Automotive Industry
- Environmental Monitoring
- Telecommunications.

## CONSULTANCY EXEMPLAR.

**Problem:** A metallic layer was required to coat an high aspect ratio tapered hole, (needle former). The metallic layer would then be used as a seed layer for electroplating.



**Solution:** A highly conformal two step tungsten deposition using H2-WF6 chemistry, unique to QUB. See above micrograph.



Once refilled, the needles are exposed by removing the bulk silicon enabling a state of the art electrode packing density.



Commemorative image of the Titanic etched into silicon and bonded to a glass substrate

### Contact Information:

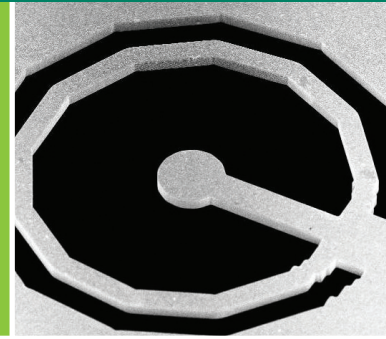
QAMEC,  
EECS,  
Queen's University Belfast  
BT95AH  
Ph. 44 (0)2890975598  
<http://www.qub.ac.uk/research-centres/QAMEC>



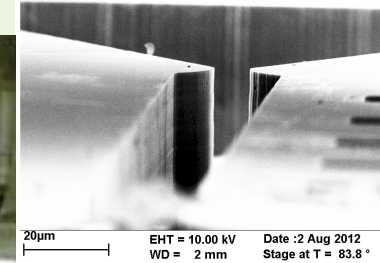
QUEEN'S ADVANCED  
MICRO ENGINEERING  
CENTRE

MEMS

MICROELECTRONICS  
TRAINING



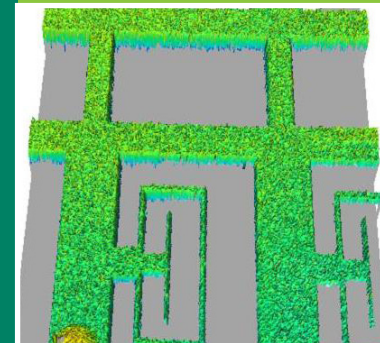
INCUBATION



FOUNDRY SERVICES



PROCESS  
DEVELOPMENT



## INTRODUCTION

Formerly the Northern Ireland Semiconductor Research Centre, QAMEC is a centre of excellence for research and development employing silicon technology and MEMS technology. The centre has established itself, in partnership with the High Frequency Electronics Group, in the design and fabrication of Frequency Selective Surfaces serving the European Space Agency. Whilst primarily a MEMS facility, the centre offers support through technology transfer, training and collaborative enterprise to industry in new growth areas. Expertise transferred from the NISRC includes **Wafer bonding**: incorporating silicon bonding, germanium bonding to sapphire, bonded substrates with advanced Compound Buried Layers(CBL), **Device fabrication**: Low temperature P-MOS/N-MOS germanium transistors, Thin Film Transistors and bipolar transistor fabrication. The facility prides itself on being flexible and reactive to customer needs.

## MICROFABRICATION

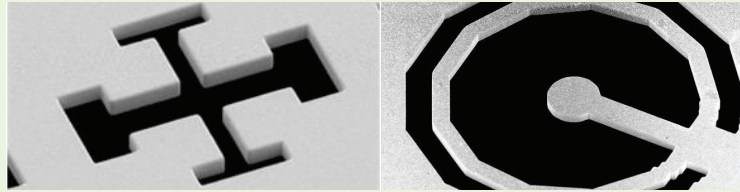
QAMEC operates a class 400 cleanroom, housing class 100 processing stations for front end processing. The core equipment set can accommodate processing of silicon substrates up to 150mm diameter, as well as offering the versatility of handling non standard substrates such as Sapphire, Germanium and semiconductor grade Quartz and Glass. The centre's test facility houses a suit of probe stations offering device testing such as CV, IV, CT, Transistor characterisation and 4 pt probe measurements. Pyrogenic probe stations offer low temperature device measurements.

Interest to industry and Academic institutions.

- Foundry services.
- Staff training.
  1. On site
  2. Off site
- Process Development and consultancy.
- Incubation
- Lab access, embed engineers.
- Responsive to change in requirement.
- Versatile facility: Varied substrate size and material - Quartz, Silicon Germanium
- KTP
- Device test suit: IV/CV/CT etc

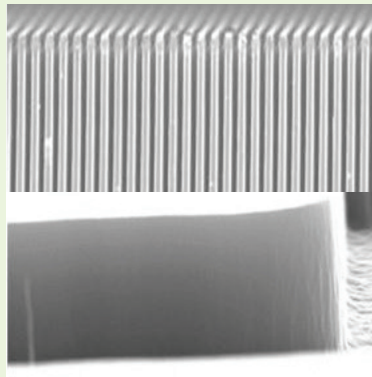
## MICROENGINEERING PROJECTS

Frequency Selective Surfaces



FSS(Dichroics) filter electromagnetic waves, (mainly in freq) Employed in emerging commercial and defence applications.

### DEEP REACTIVE ION ETCHING



DRIE fast silicon etching using a SF<sub>6</sub>:C<sub>4</sub>F<sub>8</sub> BOSCH process. Note good aspect ratios. (5µm wide 100µm deep)

Slow silicon etching employing a BOSCH process with fast gas switching and optimised process conditions

### RF MEMS

Integrated inductors are desirable for high performance radio frequency and microwave front end integrated circuits.



Capacitive switch that utilises electrostatic force to produce mechanical movement to achieve a short or an open circuit in an RF transmission line.



## FOUNDRY SERVICES

**Lithography:** EV 420 double side aligner. Feature size: 2µm  
Mask Making: Design and production of 125 -150mm SQ reticle.

**CVD Processing:** Low temperature oxide (LTO), LPCVD/PECVD Si<sub>3</sub>N<sub>4</sub>. LPCVD polycrystalline silicon and amorphous silicon. ALD HfO<sub>2</sub> and Al<sub>2</sub>O<sub>3</sub>

**Thermal Processing:** Wet and Dry Oxidation. High Temperature annealing. Rapid Thermal Annealing. Solid Source diffusion.

**Plasma Etching:** RIE of Si<sub>3</sub>N<sub>4</sub>, SiO<sub>2</sub> and silicon. STS etching system. Alcatel ICP etching system for DRIE etch of silicon (BOSCH).

**Metallisation:** RF and DC sputtering (W, Ti, Ta, Ni, Cu, TiW, Al). CVD tungsten and tungsten silicide (WF<sub>6</sub>-H<sub>2</sub>-SiH<sub>4</sub>)

**Chemical Mechanical Polishing:** Silicon, Polysilicon, Germanium, Copper.

**Wet Processing:** Substrate cleaning and wet etching.

**Surface and Thin Film Measurement:** Tencor Stylus profileometer, Talysurf white light interferometer, Nanometrics thickness measurement, SEM.

**Measurement and Test:** CV, IV, Wentworth probe station and cold station. (-200C to 250C).

**Further Info:** [www.qub.ac.uk/research-centres/QAMEC](http://www.qub.ac.uk/research-centres/QAMEC)

