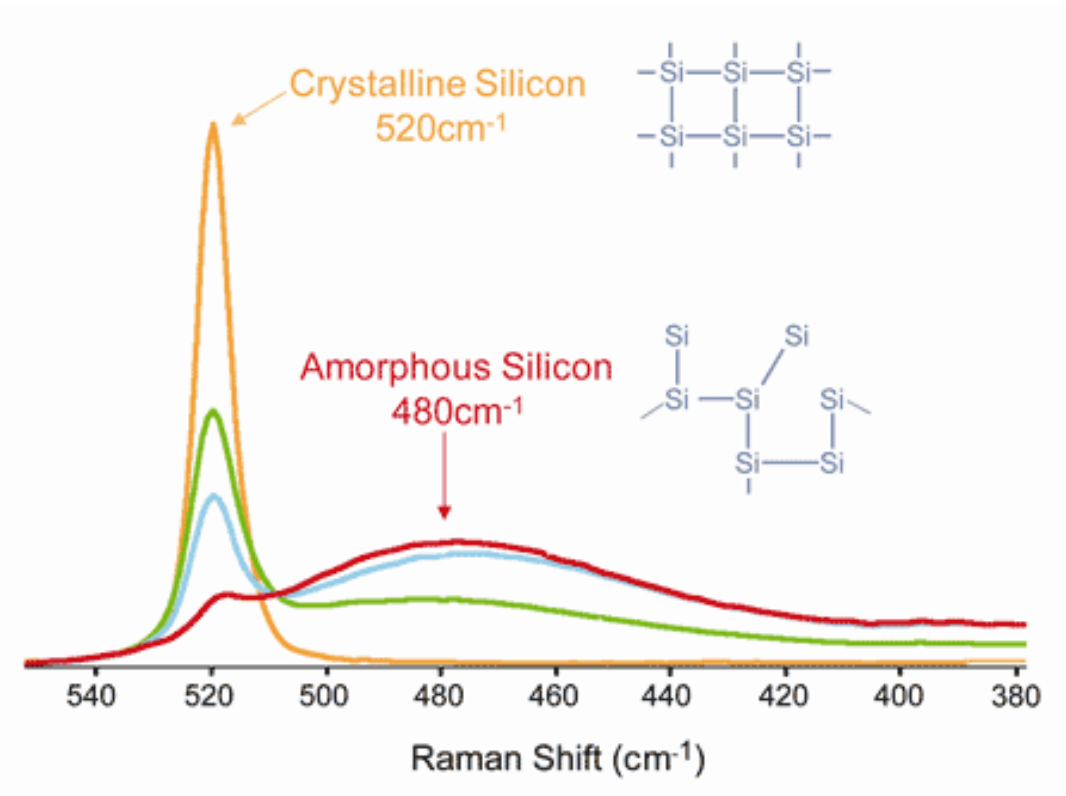


Raman Spectroscopy for Semiconductor Industry

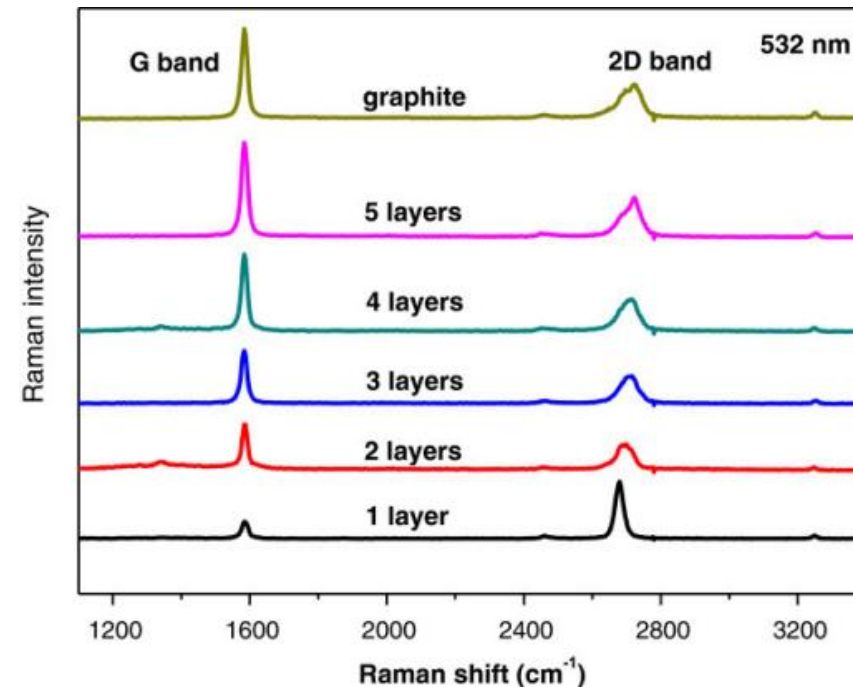
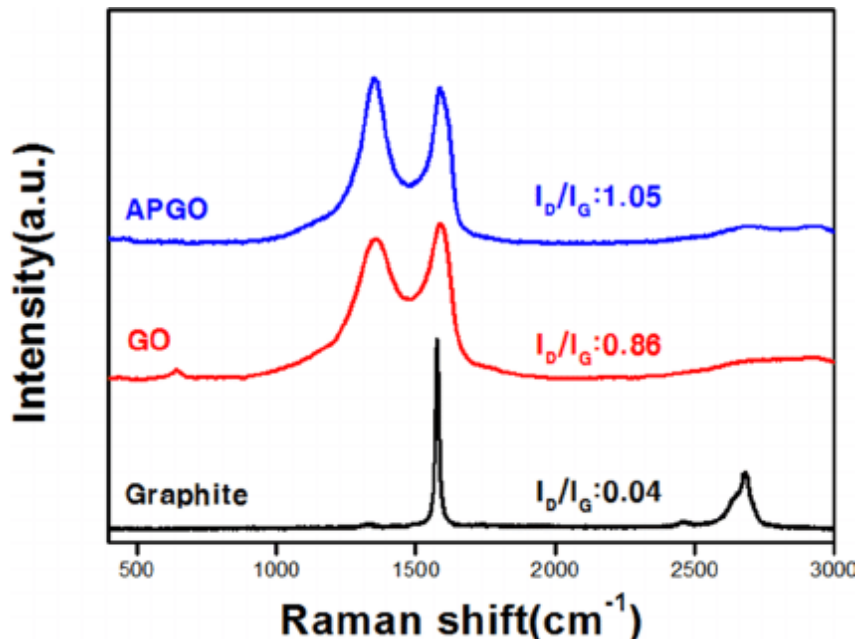
Si Crystallinity Characterization

- Material characterization through changes of Raman peak position, height, and shape
- Raman spectra revealing different silicon crystallinity Highly-crystalline: orange trace
- Low crystalline to amorphous: green, blue, red trace



Graphene Characterization

- Material characterization through changes of Raman peak position, height, and shape
 - Raman peak ratio I_D/I_G characterizes the level of disorder in carbon nanomaterials
 - Features such as band position, height and shape change as the number of graphene layers change



MultiSpec[®] Raman System

Design-In Platform



- High Speed Raman spectrometer using fiber optic probes
- 785 nm wavelength laser excitation
- Class 3B laser, 500 mW, can be split up to 4 channels
- Cross section converter with collection fiber diameter of 600 μm
- Spectral range 300-3100 cm^{-1}
- Spectral Resolution $\sim 7\text{cm}^{-1}$ FWHM
- Permanently wavelength calibrated
- Multi-channel collections using up to 4 Raman probes
- tec5 proprietary design of 4-serial interlock chain
- Class 1 Laser installation according to IEC 60825-1
- Spectrometer interface: USB or Ethernet
- 19" rack-mount standard, maintenance free
- Tamper proof featuring RFID switch, lockable connectors available

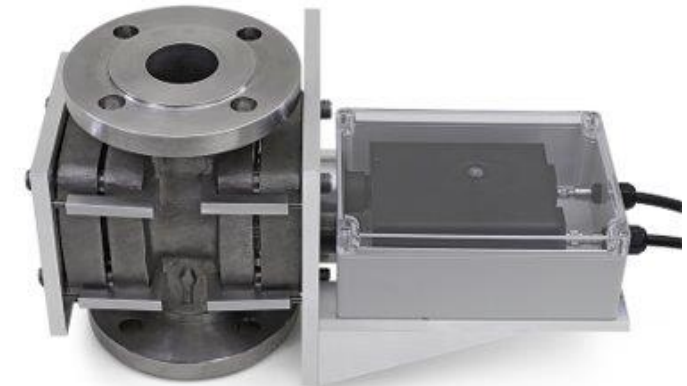
MultiSpec[®] Raman system

- Lab testing
- Design in Platform
- Factory acceptance test (FAT)



tec5 Raman Sampling Optics

- Raman optics with 25mm focal length
- Coupling to fiber optics
- For process and laboratory
- Measurement through cuvette
- Measurement through clear glass
- Measurement through clear tube
- Process integration possible



Probe Material	Anodized aluminum
Focal Plane	25 mm, 50 mm
Length of Fibers	2 m [standard], other lengths available on request
Connectors	FC/PC [Laser], SMA [Detection]
Operating Temperature	5 – 45 °C standard temperature range [contact tec5 for additional range]
Weight	1.75 kg
Dimensions [W x H x D]	100 x 60 x 140 mm

tec5 Process Raman Probe

At-Line or Lab Measurement

- Immersion Raman Probe with improved efficiency and stability
- Probe Interlock ensures the laser stops when the probe retraction occurs



Fiber Optic Immersion Probes

Probe Material [in contact with sample]	316L / sapphire / O-Ring sealed
Focal Plane	2.1 mm from front window [typ. - shorter distances <1.5 mm possible]
Length of Fibers	5 m [standard], other lengths available on request
Temperature Range	5-180°C
Pressure Range	-1 - 40 bar [without flange]
Interlock	Connector on the probe body
Laser Status	LED, yellow