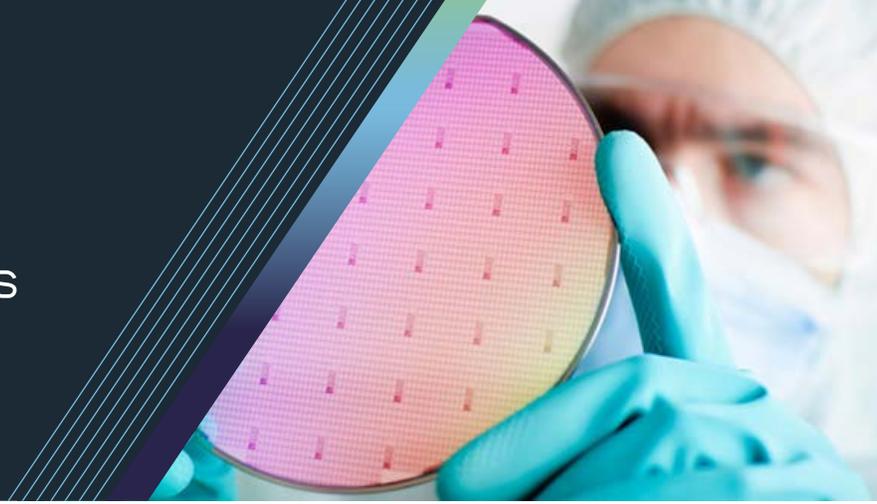
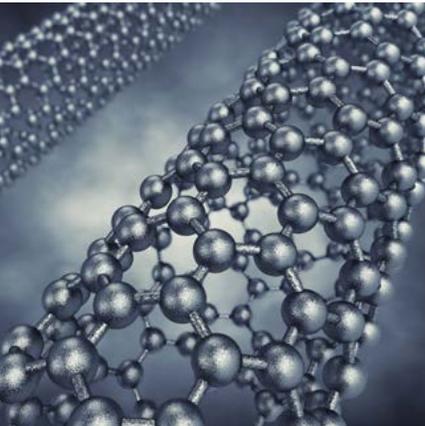




## Supporting the Materials Research of the Future



**We are on the precipice of a new age in materials research that will enable products and functions we never believed possible. Today, advances in materials science are driving the future of many industries, including engineering, where the electrical properties of materials can reveal previously unknown materials characteristics.**

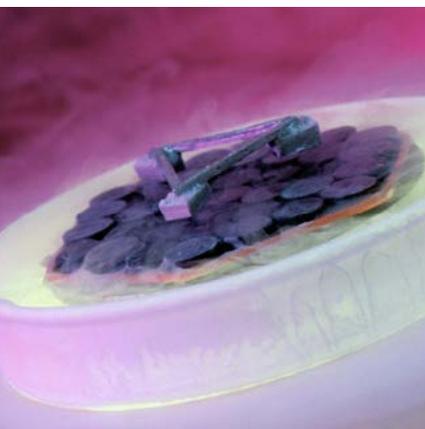


### Materials of Tomorrow

Industry demands require that the materials of tomorrow be smaller, lighter, faster and more affordable than ever. To address these needs, researchers are working hard to miniaturize existing devices, improve device efficiencies, enhance existing materials and, at the same time, develop completely new materials that could take us down unique and innovative pathways.

### Electrical Characterization of Materials

Tektronix and Keithley have created some of the most sensitive test and measurement instrumentation in the world. As leader in low level measurements, our instrumentation has been vital to helping researchers, scientists and engineers unlock the potential of new materials.



### Low Resistance Materials

From new metal alloys to superconducting ceramics, new materials with low resistance are being developed every day. The electrical properties of these materials can help determine everything from purity to crystal structure, and making measurements from these materials requires equipment capable of discerning very low voltages and sourcing precise currents.

Low resistance materials offer challenges due to the ease with which they conduct electricity. Without dangerously high current, low resistance materials present only very small voltages that can be well below the capabilities of traditional bench instruments.



### High Resistance Materials

Keeping electricity in its place requires high resistance materials in the form of insulators. Even semiconductors like silicon have a high impedance that must be measured before they are doped in to increase conductivity, which makes having precise equipment even more important.

It can be difficult to electrically characterize high resistance materials precisely because they can prevent appreciable current from flowing. Sensitive equipment like electrometers and picoammeters are required to measure these small currents that often can't be detected by standard bench equipment.

## Product Solution Highlights

To achieve accurate measurements for both low and high resistance materials, very precise current sourcing is needed, and many of the materials require sensitivity near the theoretical limits imposed by physics. Combined with Tektronix award-winning tools, Keithley's line of sensitive DC instruments and source measure units (SMUs) are the modern tools of choice for characterizing these materials.



### Keithley Graphical Touchscreen SourceMeter® Source Measure Unit SMU Instruments

Offering four-quadrant precision voltage and current source/load coupled with measurement on an intuitive touchscreen user interface, these instruments can simultaneously source and measure current from 10 fA to 10 A pulse and/or voltage from 100 nV to 1100 V for 1000 W pulse and 100 W DC total power.



### Semiconductor Parameter Analyzer

Parameter analyzers like the 4200A-SCS allow for reliability and failure analysis studies of semiconductor devices, materials and process development.



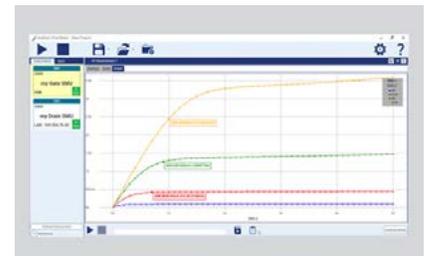
### Keithley High Resistance/ Low Current Electrometers

An electrometer's special input characteristics and high sensitivity allow it to make measurements far beyond those possible with a conventional digital multimeter.



### Keithley Low Resistance/ Low Voltage Instruments

A precision current source combined with a highly accurate nanovoltmeter allows materials researchers to measure down to micro-ohms with controlled current sourcing.



### Keithley KickStart Software

Start measuring in minutes without complex programming. Perform I-V characterization and more with this instrument control software for bench instruments and Tektronix oscilloscopes.

## Additional Resources

- [Low Level Measurements Handbook](#)
- [Characterization of New Materials and Devices Webinar](#)
- [Improving Characterization and Measurement Practices for Research Webinar](#)
- [Performing Strain Gauge Measurements Application Note](#)