



FIG. 5.6 Normalized temperature resolution of commercial cryogenic thermometers, $\Delta T/T$ (from Lake Shore Cryotronics 2002 and product literature). ΔT is the smallest temperature change that can be resolved under the typical operating conditions listed below; that is, the lower a curve's position on the plot, the better. The data assume a 5-1/2-digit voltage readout with a $0.1 \mu\text{V}$ resolution or a 5-digit capacitance readout with a 0.1 pF resolution.

Au-Fe thermocouple: Thermocouple (KP chromel vs. Au-0.07%Fe referenced to 0 K); **Capacitor:** Capacitance thermometer: 5 V at 5 kHz; **Carbon-glass:** Carbon-glass resistor: 2 mV or $0.1 \mu\text{A}$ minimum operating current; **Cernox™:** Zirconium-oxynitride resistor: 2 mV or $0.1 \mu\text{A}$ minimum operating current; **GaAlAs diode:** GaAlAs diode operating at $10 \mu\text{A}$; **Ge:** Germanium resistor: 2 mV or $0.1 \mu\text{A}$ minimum operating current; **Pt:** Platinum resistor: $100 \mu\text{A}$ operating current.; **Rh-Fe:** Rhodium-iron resistor: $300 \mu\text{A}$ operating current; **Ru-O:** Ruthenium-oxide resistor: $10 \mu\text{A}$ operating current; **Si diode:** Silicon diode operating at $10 \mu\text{A}$