ProboStat™ ACIS

Sample Holder for AC Conductivity Measurements and Impedance Spectroscopy

ProboStat™ ACIS is a sample holder dedicated for AC conductivity measurements and 2-electrode impedance spectroscopy on small disk samples at high temperatures and under controlled atmospheres.

Special design of the hot-zone parts facilitates mounting and replacement of test samples compared with the standard ProboStat™ furnishment.

The test sample rests in a support tube, is contacted by electrode contacts, and held stably in place with a spring load assembly. The setup is assembled in a single chamber mode and can be fed with virtually any gas. The sample holder is designed to operate at near-atmospheric pressure, but can be pumped to low vacuum, or hold up to 15 bar. Electrical connections are made via standard coax cables.

ProboStat™ ACIS Compatibility

The system is supplied with a standard ProboStat™ base unit and can be expanded for any sample geometries and measurements that ProboStat™ can support.

The ProboStat™ ACIS works well with all instrumentation such as impedance spectrometers, LCR meters and potentiostats from Solartron, PAR, Novocontrol, Autolab, Gamry, HP/Agilent, etc.

ProboStat™ ACIS Specifications

Temperature range:
- RT – 1600°C

Atmospheres:
- Oxidizing, inert, reducing
- Wet, dry
- Corrosive optional
- 0.01 mbar – 1 bar (15 bar optional)

Base unit:
- Ni-plated brass (SS316 optional)
- 6 BNC electrode connections
- 3 thermocouple connections
- 4 Swagelok quick-connects - two gas in and two gas out
- 16 mini-contacts for detachable electrodes and thermocouples
- 3 switches for grounding and shielding options
- Cooling/heating water hose fittings

Hot zone parts:
- Specially designed sample support tube of alumina
- Spring-load assembly of alumina
- 2 electrode contacts: Pt+alumina
- Thermocouple: type S or K

Test sample size:
- Disk diameter: max 15 mm
- Height: max 10 mm

Outer system dimentions:
- Outer tube diameter: 40 mm
- Overall length: 75 cm

Materials properties measured and applicable methods

- AC conductivity vs T, pO_2, pH_2O, etc.
- Impedance spectroscopy
- Bulk, grain boundary and electrode impedance
- H/D isotope effect
- Fuel cell components test
- Dielectric properties
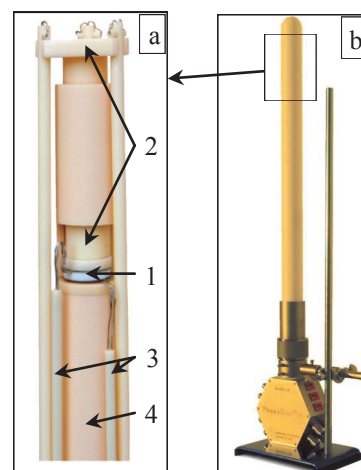
Fig.1 ProboStat™ ACIS:
(a) hot-temperature zone
(b) fully assembled

Hot-temperature zone:
1. *Test sample*
2. *Spring-loaded system*
3. *Electrode connects*
4. *Sample support tube. The standard thermocouple is inside of the sample support tube*

NORECS products

Measurement Systems

ProboStat™	Versatile sample holder system for measurements of electrical properties, transport parameters, and kinetic of materials, solid/gas interfaces and electrodes at high temperatures under controlled atmospheres.
SeebSys	System for automated measurements of Seebeck coefficient and electrical resistance at high temperatures and under controlled atmospheres. Measurement software included.
CoulTCell	Coulometric titration system for measurements of materials oxygen nonstoichiometry at high temperatures under different oxygen partial pressure. Measurement software included.
Tubular membranes and electrolytes for ProboStat™	Use standard ProboStat™ for tubular gas separation membranes or electrolyte cells. Catalytic Membrane Reactor (CMR) for turbular ceramic membranes with CMR-modified ProboStat™.

Software

Omega	Multipurpose measurement and data analysis software for electrochemical measurements. Omega is designed for maximum flexibility: it accepts data from many different sources such as instruments, furnaces and mass flow controllerrs. It can plot any measured or calculated data. With no time restrictions nor limit for simultaneous measurements. It was originally developed for ProboStat™ users.
Omega Temp	Software to control and program furnace temperatures and profiles, with unlimited number of segments.

Atmosphere control

ProGasMix	Versatile rotameter-based manual gas mixer especially developed for laboratory investigations of the properties of oxides at high temperatures vs T, pO2, pH2O etc., or fuel tests with humidification of fuel and/or oxidant. Partial pressures are calculated via accompany software. Allows measurements of proton and oxide ion transport numbers separately.
FCMix	Simple and low-cost gas mixer that controls the flows of fuel, oxidant and one inert gas that can be routed to the fuel and oxidant for flushing, soft start, slow SOFC anode reduction, and safe operation, as well as tests of gas diffusion limitations.
Probble	A combined humidification unit and over-pressure controller suitable for small gas flows to SOFC button cell testing, annealing furnaces, etc. Two units used together with FCMix give combined humidification and overpressure control of each ProboStat™ cell chamber as well as fine pressure control in and between two cell chambers.

We supply

Furnaces	Furnaces customized for ProboStat™
TempBox	Simple thermocouple reader with USB port
PLD targets	8YSZ, BZY-Ni, BZY, etc.
SOFC button cells	Anode supported cells with 8YSZ electrolyte, porose nickel cermet anode and and lanthanum cobaltite cathode

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