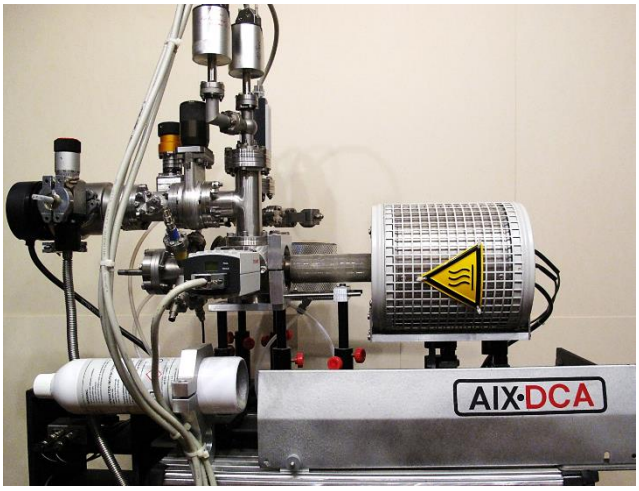
aixDCA

aixDCA – Defect Chemistry Analyzer

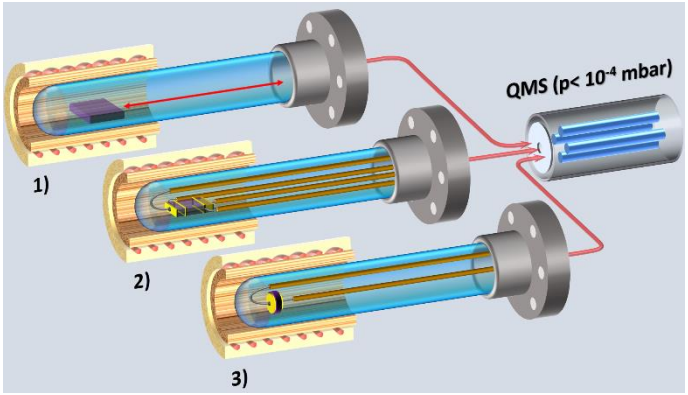
The Defect Chemistry Analyzer aixDCA is a 4-point-measurement system for electrochemical measurements in temperature controlled pure oxygen environment.

Key facts

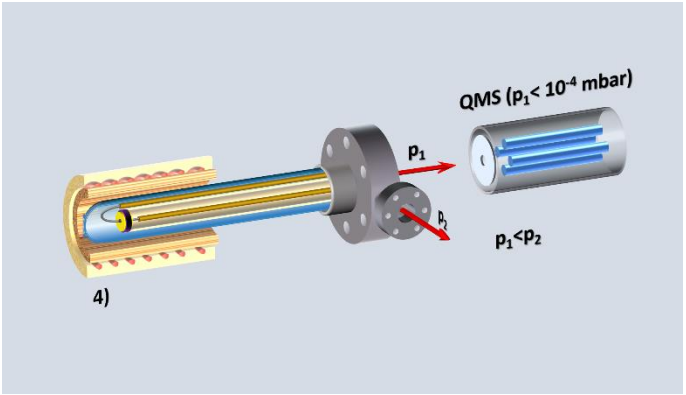


- Pure oxygen environment 1000 mbar – 10^{-8} mbar
- No carrier gases needed
- Furnace temperature 25°C – 1000°C
- 4-point-electrical measurement
- Electrometric follower and lock-in amplifiers
- Quadrupole mass analyzer
- Two-compartment adapter
- Electrical conductivity relaxation (ECR) and high-temperature equilibrium conductivity (HTEC) measurements

The pure oxygen environment inside the sample holder can supply the sample with oxygen pressures between 1000 mbar and 10^{-8} mbar and temperatures form room temperature up to 1000°C without the influence of additional gases. Conductivity measurements can be realized in 4-point and in 2-point configuration using the built-in electrometric follower and lock-in amplifier. The quadrupole mass analyzer detects oxygen release from the sample and can be used as migration and permeation detector with the use of the two-compartment adapter.



Single compartment pure oxygen sample holder for exact dosing and pressure control. Resistivity and impedance analysis as function of pressure and temperature.



Double compartment sample holder for diffusion measurement as function of pressure difference and applied electric field.

aixACCT Systems GmbH
Talbotstr. 25
52068 Aachen
Germany

Phone: + 49 (0) 241- 47 57 03 0
Fax: + 49 (0) 241- 47 57 03 66

E-mail: info@aixacct.com
www.aixacct.com

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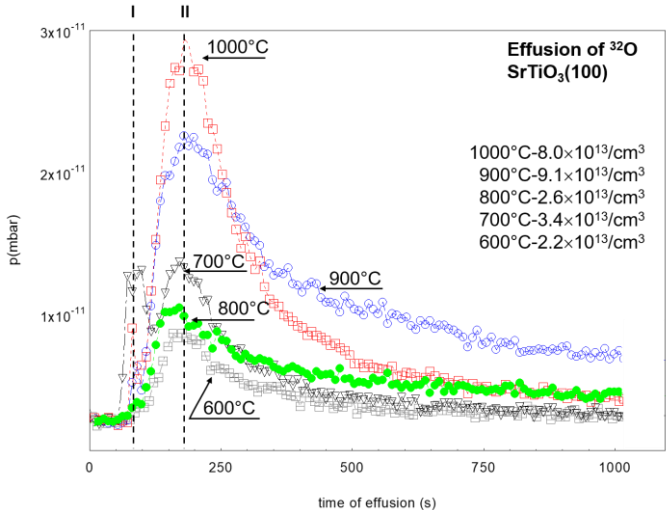
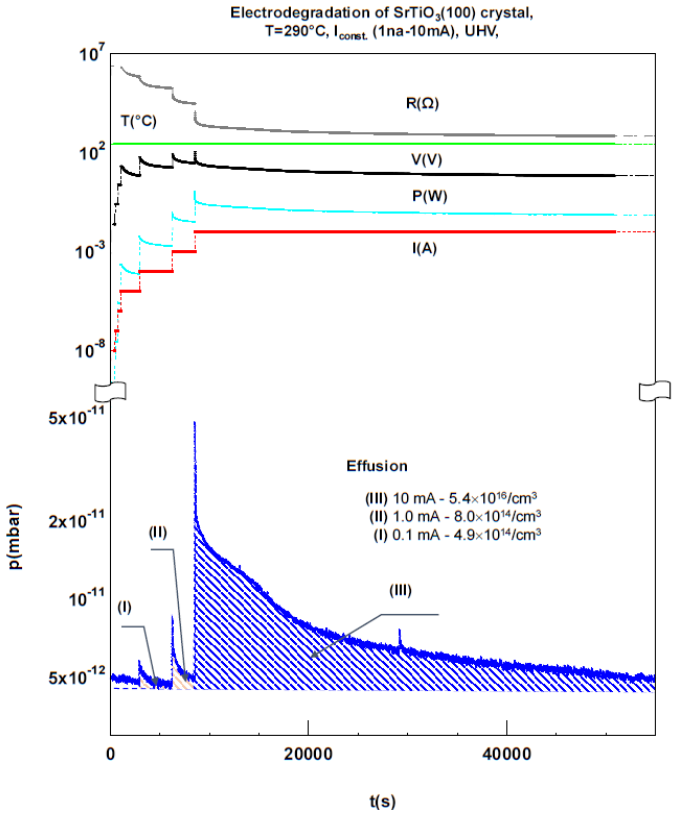


Measurement of the thermo-stimulated desorption of oxygen (obtained using mass spectrometry) during successive reduction of $SrTiO_3$ crystal under UHV conditions (T = 600°C –1000°C) shows that the total concentration of the oxygen molecules, which have left the crystal is smaller than$10^{15}/cm^3$. Notice: The system was calibrated using controlled pump out under isobaric conditions ($p_{const.} = 10^{-6}$ mbar) of the vessel with exactly defined concentration of oxygen.

The measurement was carried out with sample holder 1).

Ref.: Review: "Influence of Dislocations in Transition Metal Oxides on Selected Physical and Chemical Properties", Szot K et al. Crystals, 2018,**8**, 241; doi:10.3390/cryst8060241



Study of electro-degradation (const. I) and effusion processes shows that the decrease of the resistance of a $SrTiO_3$ crystal can even be observed for very low currents. A measurable effusion of oxygen from the crystal can be identified for currents as low as 0.1 mA. Yet notice, although electro-degradation with I ~ 0.1 mA already leads to a "switching" of the electrical properties of the crystal into metallic properties the total concentration of removed oxygen is still much lower than predicted from Mott criterion.

The measurement was carried out with sample holder 2).

Ref.: Review: "Influence of Dislocations in Transition Metal Oxides on Selected Physical and Chemical Properties", Szot K et al. Crystals, 2018,**8**, 241; doi:10.3390/cryst8060241

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Germany

Phone: + 49 (0) 241- 47 57 03 0
Fax: + 49 (0) 241- 47 57 03 66

E-mail: info@aixacct.com
www.aixacct.com