
# SCIENTIFIC PROGRAMME

## XV Reunión Nacional de Electrocerámica

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# Posters

| | |
|---|---|
| P01 | Co-sintering of LSM-YSZ and Ni-YSZ electrodes and YSZ electrolytes via fused filament fabrication — *J.C. Pérez-Flores, M. Castro-García, J.F. Valera-Jiménez, J.R. Marín-Rueda, J. Canales-Vázquez* |
| P02 | $Sr_4Mn_2CuO_9$ black wide band semiconductors with high NIR reflectance prepared by gel methods — *G. Monrós, S. Cerro, M. Llusar, J.A. Badenes* |
| P03 | Ionic-electronic transport in zircon-type $PrVO_4$-based ceramics — *R.G. Pinto, B.I. Arias-Serrano, A.A. Yaremchenko* |
| P04 | Hierarchically micro/mesoporous silicon oxycarbide derived materials as electrodes for energy storage storage applications — *M.A. Mazo, M.T. Colomer, A. Tamayo, J. Rubio* |
| P05 | Pyrochlore-type $Y_2Ti_2O_7$-based titanates as buffer layer materials for fuel-assisted solid oxide electrolysis cells — *A.D. Bamburov, A.A. Yaremchenko* |
| P06 | Phase composition, poling and functional properties of $Ba_{0.85}Ca_{0.15}Ti_{0.9}Zr_{0.1}O_3$ ceramics — *C.E. Ciomaga, L.P. Curecheriu, A.V. Lukacs, M. L´hereux, M.H. Chambrier, R. Desfeux, L. Mitoseriu* |
| P07 | Magnetoelectric studies of $(Ba,Ca)(Zr,Ti)O_3$—$(Ni,Zn)Fe_2O_4$ multiferroic composites — *I. Coondoo, A. Kholkin* |
| P08 | Functional properties in $BaTiO_3$-$CoFe_2O_4$ composites: modelling and experimental validation — *L. Padurariu, C.E. Ciomaga, M. Airimioaei, L. Curecheriu, L. Mitoseriu* |
| P09 | Monte Carlo simulation of vacancies produced in lead-free piezo-ceramics by X-ray radiation damage — *O. López-López, M.E. Montero-Cabrera, L. Pardo, R. Domínguez-García, L. Fuentes Cobas* |
| P10 | Synthesis, ceramic processing and properties of $Bi_3Ti_{1-2x}Nb_{1+x}Fe_xO_9$ with $0 \leq x \leq 0.5$ — *A. Barreto, M. Algueró, R.P. del Real, A. Castro* |
| P11 | Post-annealing temperature effect on the structure and microstructure of $K_{0.5}Na_{0.5}NbO_3$-$BiFeO_3$ eco-piezoceramics prepared by spark plasma sintering — *A. Iacomini, G. Mulas, S. Enzo, S. Garroni, J.F. Bartolomé, L. Pardo* |
| P12 | Nanoscale piezoelectric properties and phase separation in pure and La-doped $BiFeO_3$ films prepared by modified sol-gel technique — *S. Kopyl, A.V. Semchenko, V.V. Sidsky, I. Bdikin, V.E. Gaishun, D.L. Kovalenko, S.A. Khakhomov, A.L. Kholkin* |
| P13 | Photochemistry strategies to prepare flexible $BiFeO_3$ thin films by low-temperature solution methods — *A. Gómez-López, R. Jiménez. I. Bretos, J. Ricote, Y. andrea Rivas, R. Sirera, M.L. Calzada* |
| P14 | Low-temperature processed ferroelectric $BiFeO_3$-based perovskite thin films by chemical solution deposition aided by photochemistry — *Y. Andrea Rivas, A. Gómez-López, I. Bretos, R. Jiménez, J. Ricote, R. Sirera, M.L. Calzada* |

# P—05

## Pyrochlore-type $Y_2Ti_2O_7$-based titanates as buffer layer materials for fuel-assisted solid oxide electrolysis cells

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Solid oxide electrolysis cells (SOECs) are electrochemical systems enabling conversion of excess renewable energy via high-temperature steam electrolysis into hydrogen as energy carrier and sustainable fuel. Long-term degradation remains the main issue for the viability of this technology as a practical hydrogen production system. The concept of fuel-assisted SOEC relies on the supply of a low-cost fuel to the anode in order to reduce the operating potential of the cell and enhance the long-term stability of the anode/electrolyte interface.[1,2] In this configuration, conventional ceria-based buffer layers at the electrolyte/anode interface may not be applicable due to excessive chemical expansion on reducing oxygen partial pressure.

The present work explores pyrochlore-type $Y_2Ti_2O_7$-based titanates as possible alternative to doped ceria in fuel-assisted SOECs. A series of $Y_{2-x}A_xTi_{2-y}B_yO_{7-\delta}$ (A = Ca, Mg; B = Mg, Zr, Mn) ceramics were prepared by solid state reaction route. The materials were characterized by XRD, SEM/EDS and thermal analysis. Electrical studies included measurements of total conductivity as function of temperature and oxygen partial pressure (600-900°C) and determination of partial ionic and electronic contributions by the e.m.f. method (700-900°C). Thermochemical expansion was evaluated by controlled-atmosphere dilatometry at 600-900°C. The chemical compatibility at different temperatures was assessed in contact with yttria-stabilized zirconia solid electrolyte and selected oxygen electrode materials.

*References*:

[1] G. Tao, B. Butler, A.V. Virkar, ECS Trans. 35 (2011) 2929.
[2] Y. Wang, T. Liu, L. Lei, F. Chen, J. Power Sources 344 (2017) 119.

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