Electronic Supplementary Information for

Rapid Preparation of Block Copolymer Templated Mesoporous Zr$_{1-x}$Ce$_x$O$_2$ Thin Films

Ianina L. Violi$^{1,2}$, Vittorio Luca$^3$, Analía L. Soldati$^4$, Horacio Troiani, Galo J.A.A. Soler-Illía$^5$ and Andres Zelcer$^{1,2,6,*}$

$^1$ Gerencia Química, Centro Atómico Constituyentes, Comisión Nacional de Energía Atómica, Av. Gral. Paz 1499, B1650KNA, San Martín, Buenos Aires, Argentina (On leave)

$^2$ CIBION, CONICET, Godoy Cruz 2390 (C1425FQD), CABA, Argentina

$^3$ Centro Atómico Constituyentes, Comisión Nacional de Energía Atómica, Av. Gral. Paz 1499, B1650KNA, San Martín, Buenos Aires, Argentina

$^4$ Gerencia Física, Centro Atómico Bariloche, CNEA-CONICET, 8400, S.C. de Bariloche, Río Negro, Argentina

$^5$ Instituto de Nanosistemas, UNSAM, 25 de Mayo y Francia (1650), San Martín, Buenos Aires, Argentina

$^6$ ECyT-UNSAM, 25 de Mayo y Francia (1650), San Martín, Buenos Aires, Argentina.
Cauchy – Lorentz relationship

Cauchy model describes the optical properties for dielectric materials (Equation 1), which assumes \( k=0 \) meaning no absorption.

\[
n(\lambda) = A + \frac{B}{\lambda^2} + \frac{C}{\lambda^4}
\]

where \( A, B \) and \( C \) are fitting parameters.

In order to include the absorption bands present in the studied materials, Lorentz functions were added to the model description for each absorption peak (Equations 2 and 3).

\[
\varepsilon_r = \frac{A\lambda^2(\lambda^2-\lambda_0^2)}{(\lambda^2-\lambda_0^2)^2 + \lambda^2\Gamma^2} = n^2 - k^2
\]

\[
\varepsilon_i = \frac{A\lambda^3\Gamma}{(\lambda^2-\lambda_0^2)^2 + \lambda^2\Gamma^2} = 2nk
\]

where \( A \) represents the absorption band amplitude, \( \lambda_0 \) the central wavelength, and \( \Gamma \) the full width at half maximum.
Figure S1. FE-SEM top-view images of Zr$_{1-x}$Ce$_x$O$_2$ obtained for different compositions, x = 0.1, 0.2 and 0.3, and through different treatments: T1, T2 and T3 (see experimental details). Inset: FFT of the image, showing the high degree of order.
Figure S2. 2D SAXS pattern obtained right after deposition of the sol used to synthesize Zr$_{0.5}$Ce$_{0.5}$O$_2$ MPTF, and its comparison with theoretical pattern.$^2$

Figure S3. FE-SEM images of Zr$_{0.5}$Ce$_{0.5}$O$_2$ MPTF applying different post-treatments. A: T1; B: T2; C: T3. Inset: 2D-SAXS patterns.
**Figure S4.** Mesoporous $\text{Zr}_{1.3}\text{Ce}_{0.2}\text{O}_2$ films thickness vs. Withdrawal Rate

**Figure S5.** EEP isotherms (A) and pore size distributions (B) of $\text{Zr}_{0.5}\text{Ce}_{0.5}\text{O}_2$ MPTF prepared through different thermal treatments.
**Figure S6.** A) 2D SAXS patterns of the MPTF obtained with sols aged for different times. B) Interplanar distance obtained by SAXS for the different MPTF and for two extreme sols aging times. C) EEP water isotherms for MPTF deposited using sols aged for one week.

**Figure S7.** SAED images of Zr$_{0.9}$Ce$_{0.1}$O$_2$ calcined at 350°C (A), 550°C (B), and Zr$_{0.5}$Ce$_{0.5}$O$_2$ MPTF calcined at 550°C.