

Ordered Mesoporous Zirconia

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One of the most difficult tasks to prepare ordered mesoporous zirconia based materials resides on the fact that the crystallization of the walls occurs at around 300°C, provoking the collapse of the ordered porous structure during the template removal [1-4].

In a previous work [5], we reported a strategy to retain the porous network by means of a silica palisade built between the polymer template and the zirconia-ceria matrix. Even though the material presented a high surface area (around 100m²/g), this palisade was not enough to keep the ordered porous mesostructure after the calcination process.

In this work we analyzed the water quantity, as well as the amount of the tri-block copolymer template (Pluronic P-123) in the synthesis solution, aiming to obtain a hexagonal ordered material instead of a lamellar porous structure, as previously obtained. We determined an optimum water content and, the analysis of the SAXS and N₂ desorption data revealed that the decrease on P-123 content brings the phase diagram towards the hexagonal symmetry, as shown on figure 1 (a), and 1 (b).

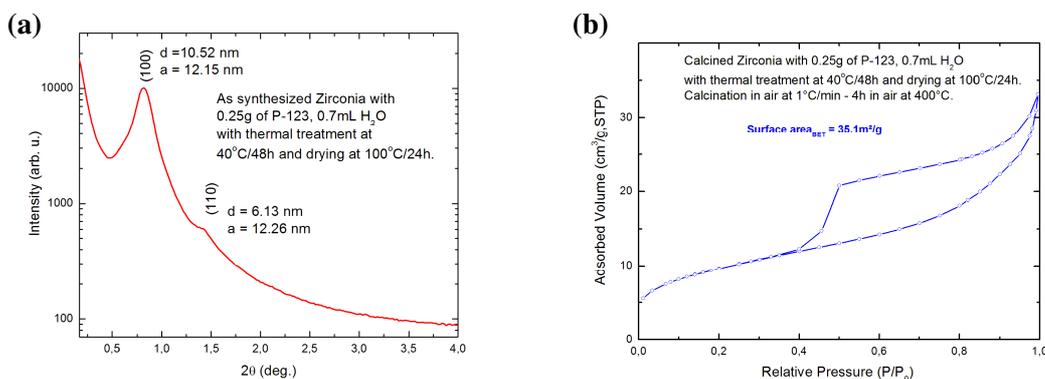


Figure 1: (a) SAXS data of as synthesized zirconia prepared with 0.25g of P-123 and (b) N₂ sorption data of calcined zirconia.

Recently we explored a technique to obtain thicker zirconia walls and to improve the mechanical stability after the calcination process. By using an autoclave during 48 hours under 80°C it was possible to maintain the ordered mesoporous structure after thermal treatment to remove the template up to 540°C.

Keywords: Mesoporous, Zirconia, SAXS.

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References

- [1] A. Sayari and P. Liu, *Microporous and Mesoporous Materials* **12**, 149-177 (1997).
- [2] P. D. Yang, D. Y. Zhao, D. I. Margolese, B. F. Chmelka, and G. D. Stucky, *Chem. Mater.* **11**, 2813-2826 (1999).
- [3] F. Chen and M. Liu, *J. Mater. Chem.* **10**, 2603-2605 (2000).
- [4] R. Bacani, T. S. Martins, M. C. A. Fantini, J. R. Matos, D. G. Lamas, *Book of Abstracts of the 9th. International Conference on Nanostructured Materials*, June 1-6 (2008), Rio de Janeiro, Brazil.
- [5] R. Bacani, T. S. Martins, M. C. A. Fantini, J. R. Matos, D. G. Lamas, R. O. Fuentes, *Book of Abstracts of the 11th International Conference on Advanced Materials ICAM*, September 20-25 (2009), Rio de Janeiro, Brazil.

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