

## ***Supplementary information***

### **First La<sub>2</sub>O<sub>2</sub>S infrared transparent ceramics**

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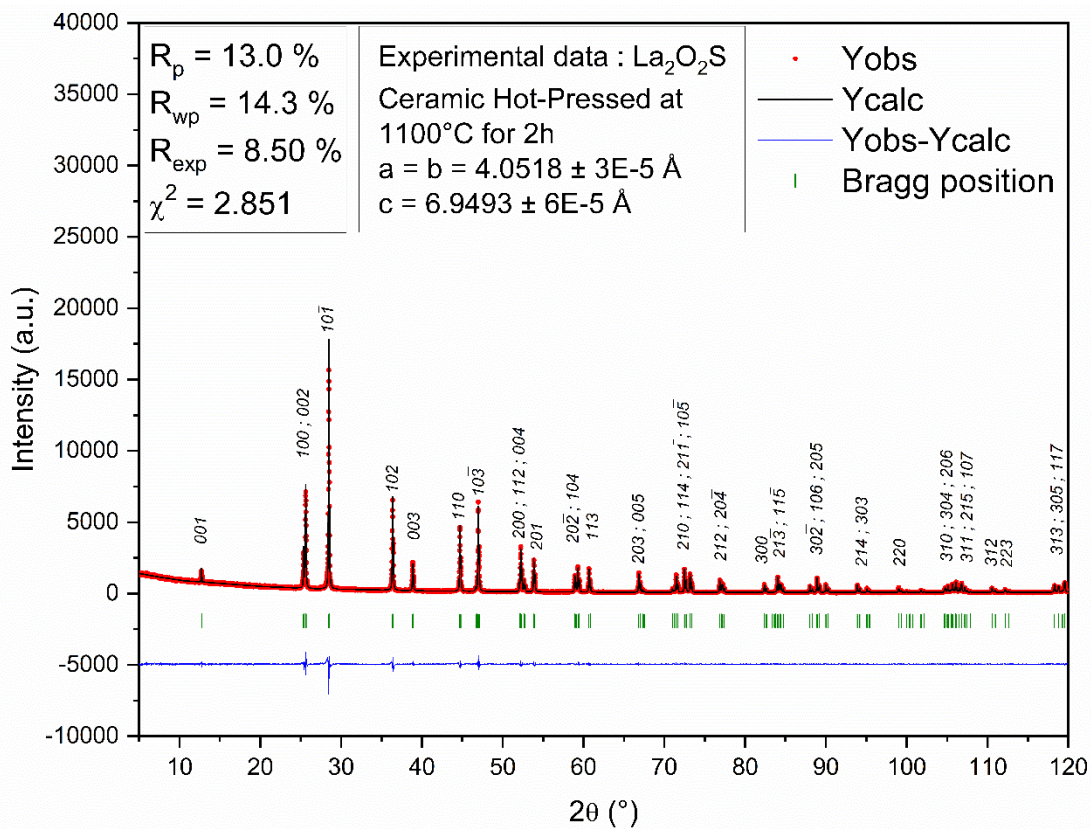


Fig. S 1. Le Bail refinement pattern of  $\text{La}_2\text{O}_2\text{S}$  ceramic hot-pressed at 1100°C for 2h. Figure of merits and refined lattice parameters are reported on the figure.

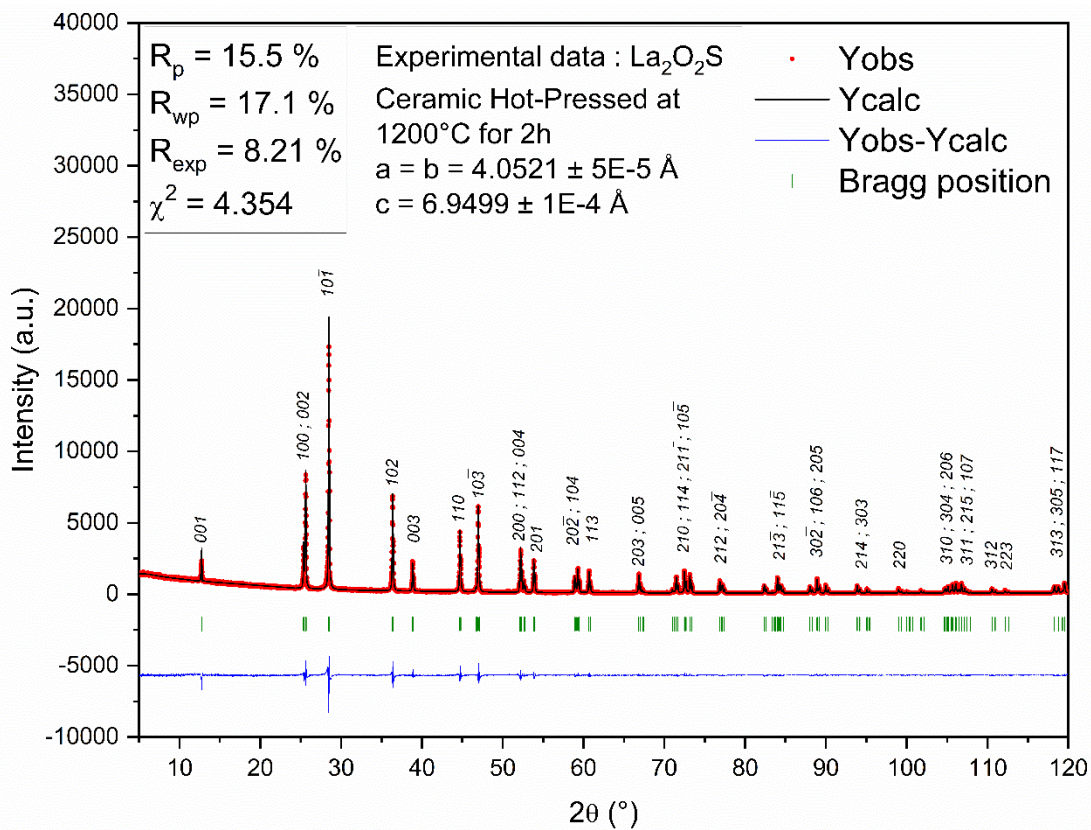


Fig. S 2. Le Bail refinement pattern of  $\text{La}_2\text{O}_2\text{S}$  ceramic hot-pressed at 1200°C for 2h. Figure of merits and refined lattice parameters are reported on the figure.



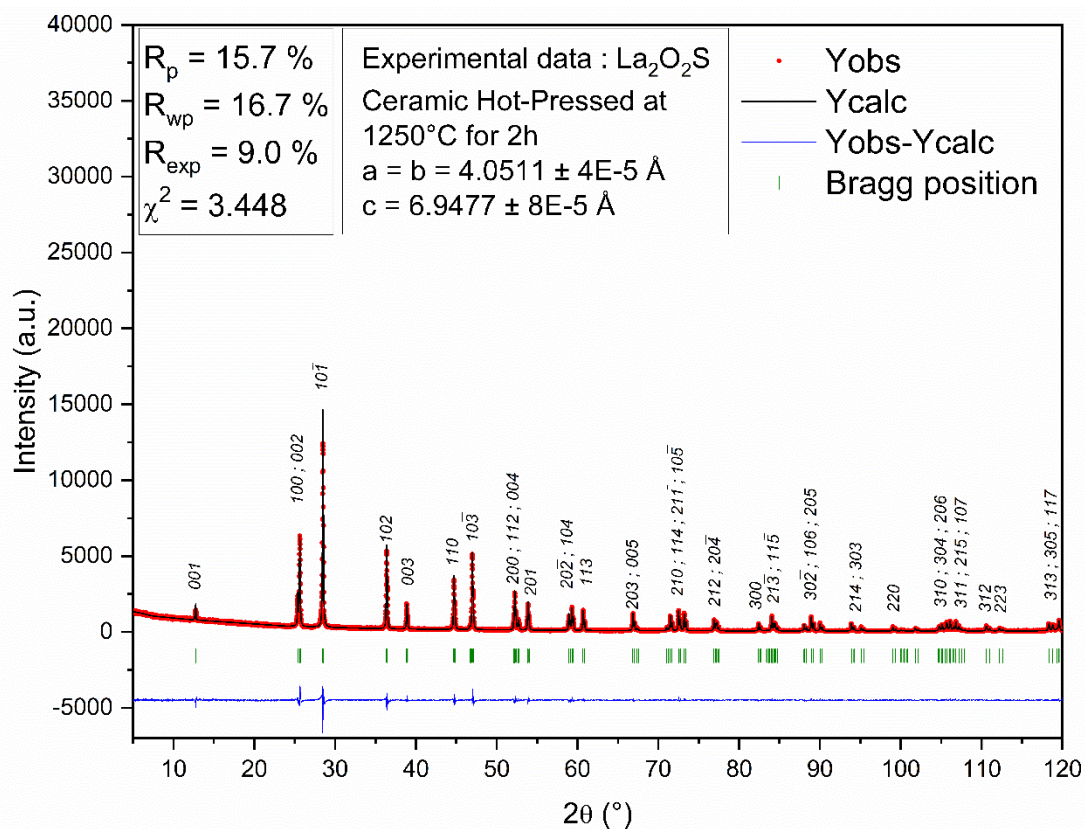


Fig. S 3. Le Bail refinement pattern of  $\text{La}_2\text{O}_2\text{S}$  ceramic hot-pressed at 1250°C for 2h. Figure of merits and refined lattice parameters are reported on the figure.

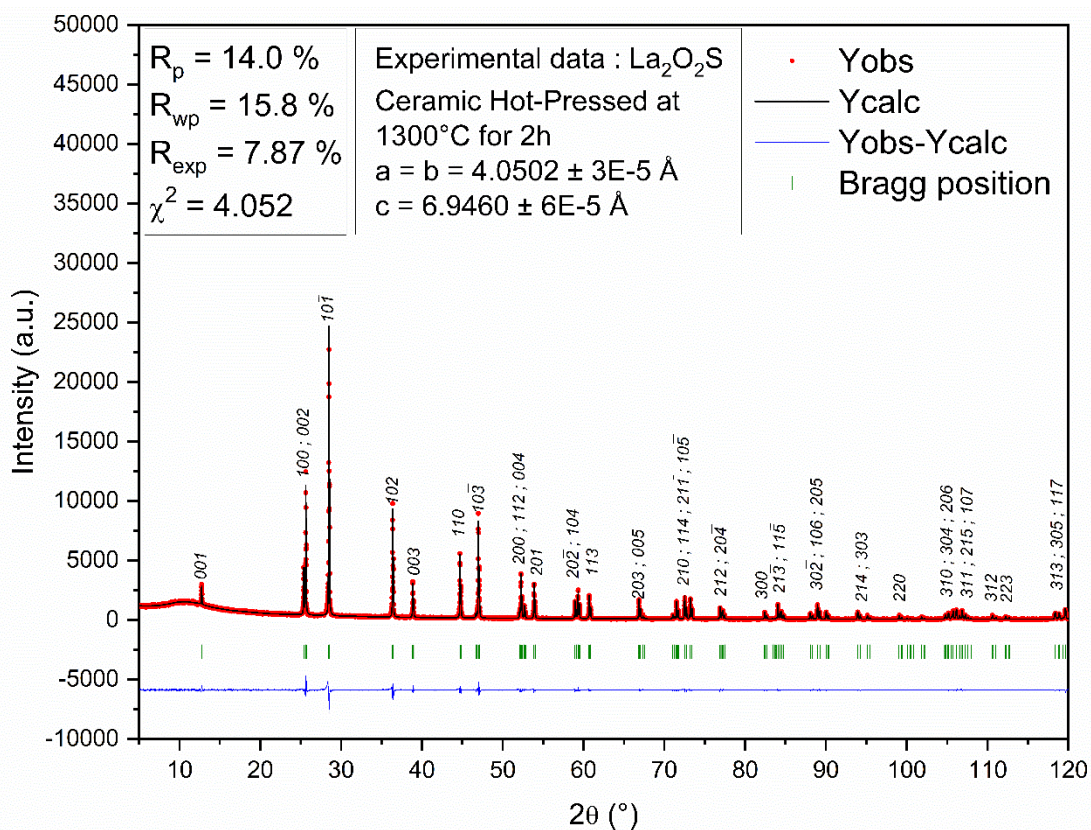


Fig. S 4. Le Bail refinement pattern of  $\text{La}_2\text{O}_2\text{S}$  ceramic hot-pressed at 1300°C for 2h. Figure of merits and refined lattice parameters are reported on the figure.



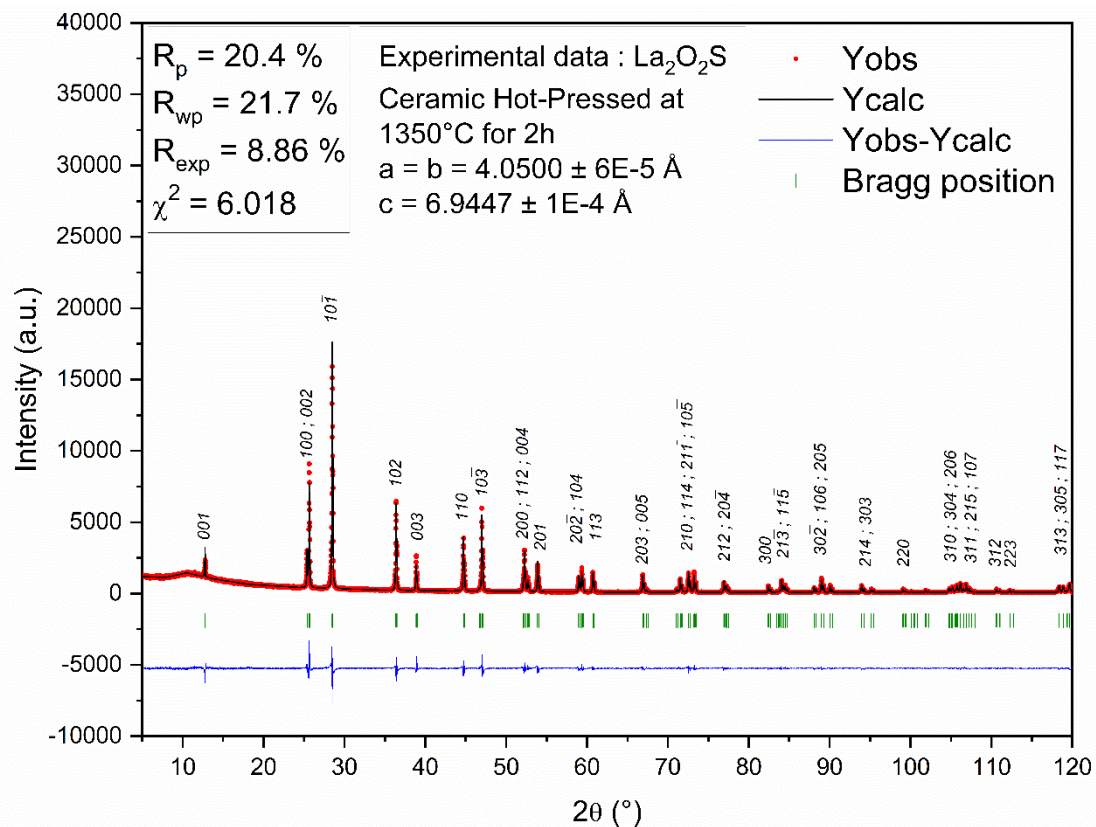


Fig. S 5. Le Bail refinement pattern of  $\text{La}_2\text{O}_2\text{S}$  ceramic hot-pressed at 1350°C for 2h. Figure of merits and refined lattice parameters are reported on the figure.

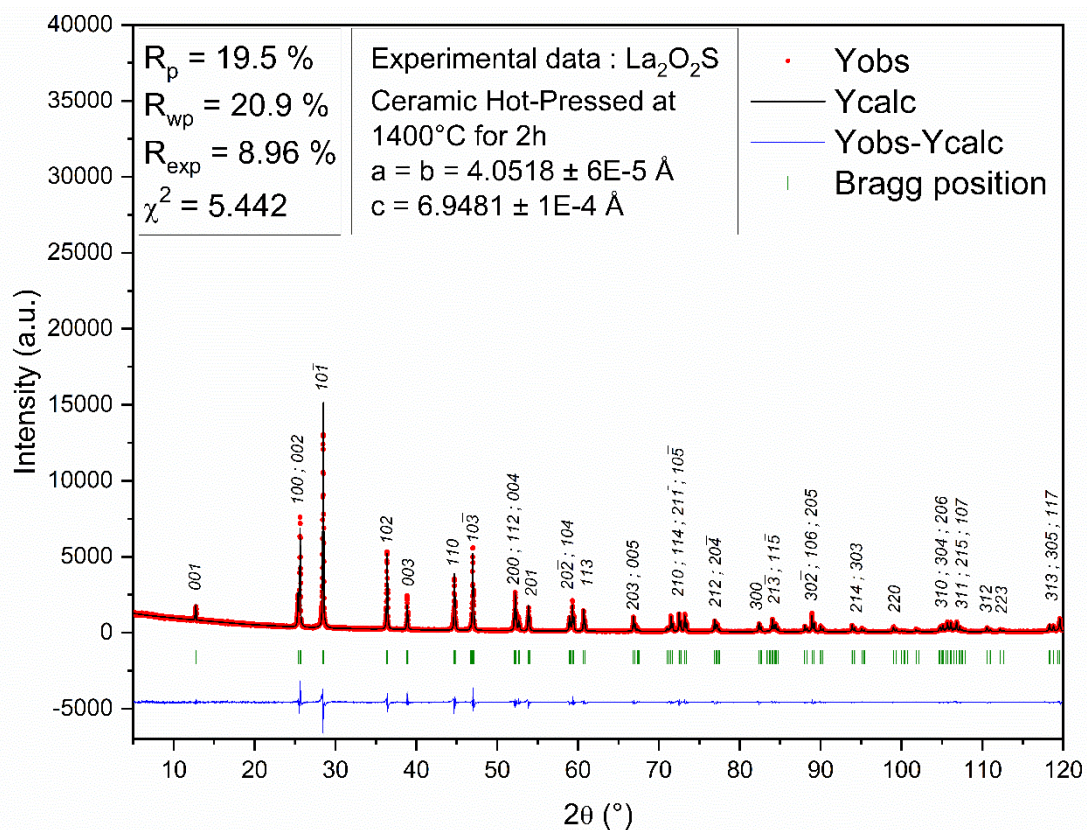


Fig. S 6. Le Bail refinement pattern of  $\text{La}_2\text{O}_2\text{S}$  ceramic hot-pressed at 1400°C for 2h. Figure of merits and refined lattice parameters are reported on the figure.

Table S 1. EDX quantitative analysis performed on ceramics sintered for 2h at 1100°C and 1400°C

Sintering conditions	Atom %		
	S K	La L	Ratio S/La
1100°C / 2h	32.3	67.7	0.48
1400°C / 2h	32.0	68.0	0.47

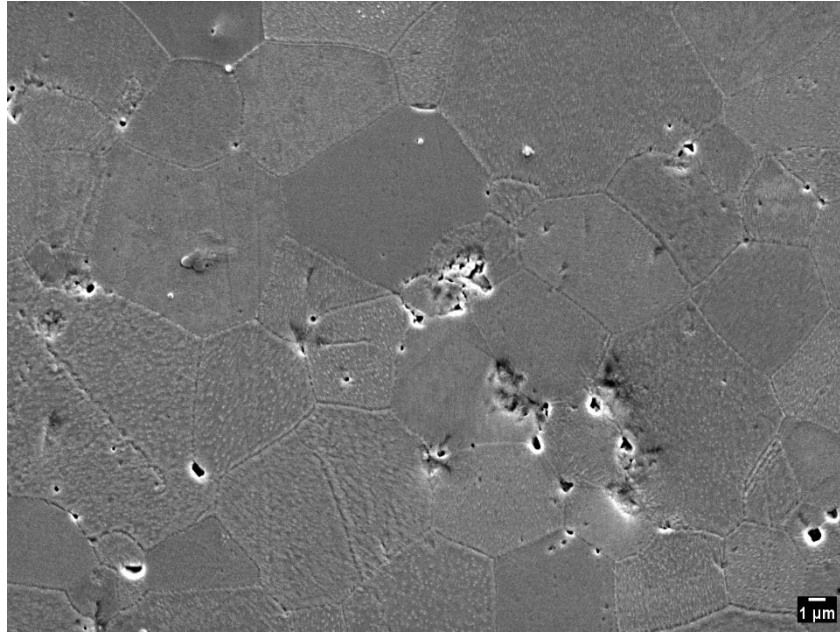


Fig. S 7. SEM images of thermally etched surfaces of  $\text{La}_2\text{O}_2\text{S}$  ceramics hot-pressed for 2 h at 1400°C ; Note the micrometric size of the pores

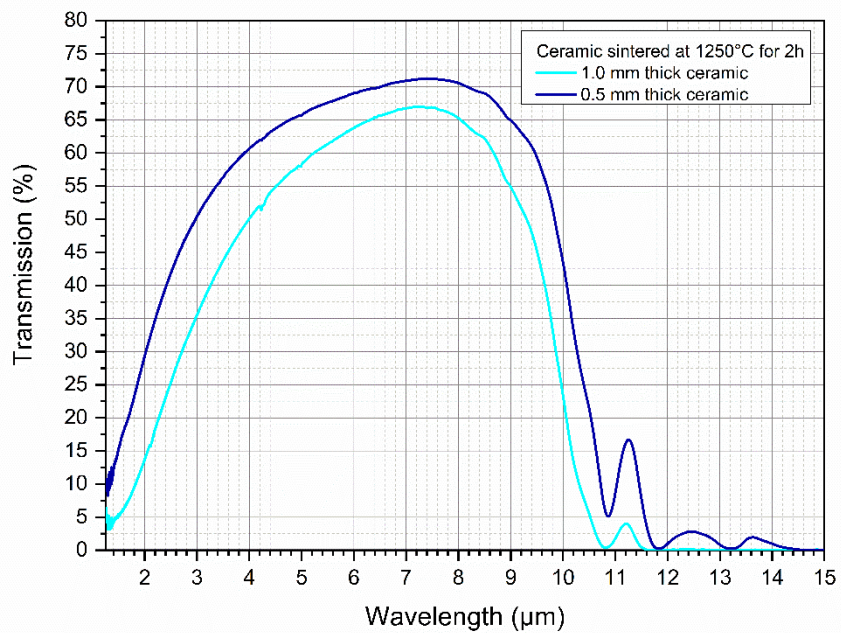


Fig. S 8. IR transmission of  $\text{La}_2\text{O}_2\text{S}$  ceramics hot-pressed at 1250°C for 2h, thickness 1 mm and 0.5 mm

Table S 2. Pore size distribution of La<sub>2</sub>O<sub>2</sub>S ceramics hot-pressed in the 1100-1400°C temperature range

Sintering conditions	Pore size (nm)		
	d10	d50	d90
1100°C / 2h	30	80	150
1200°C / 2h	30	50	90
1250°C / 2h	50	80	120
1300°C / 2h	71	140	230
1350°C / 2h	71	130	220
1400°C / 2h	140	240	430

Table S 3. Grain size distribution of La<sub>2</sub>O<sub>2</sub>S ceramics hot-pressed in the 1100-1400°C temperature range

Sintering conditions	Grain size (μm)		
	d10	d50	d90
1100°C / 2h	0.19	0.35	0.54
1200°C / 2h	0.29	0.50	0.81
1250°C / 2h	0.47	0.68	1.19
1300°C / 2h	0.70	1.70	2.88
1350°C / 2h	1.54	3.03	5.77
1400°C / 2h	1.94	4.41	8.52