

## PROPRIEDADES ESTRUTURAIS E MICROESTRUTURAIS DE MANGANITAS DOPADAS COM COBRE

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**Tabela 1S.** Dados do refinamento dos parâmetros de rede das amostras de manganitas. Para cada pico de difração, são fornecidos: os índices  $hkl$ , a distância interplanar  $d_{hkl}$ , a posição angular observada  $2\theta_{obs}$ , a posição angular corrigida  $2\theta_{obs} - \Delta\theta$  (onde  $\Delta\theta$  indica a correção angular efetuada em todos os ângulos de cada difratograma devido ao deslocamento do zero do difratômetro) e a posição angular refinada  $2\theta_{calc}$ . O índice sobrescrito  $a$  marca os picos de baixa intensidade desconsiderados devido ao ajuste gaussiano não confiável e o índice sobrescrito  $b$  marca os picos desconsiderados por sobreposição com o anterior. Os valores para grandezas angulares estão expressos em graus

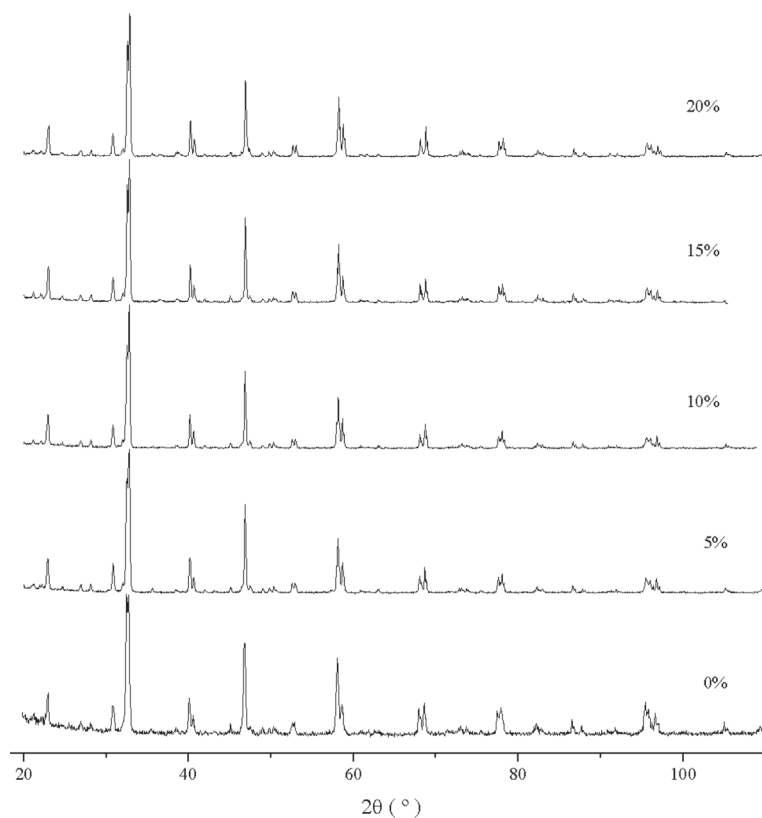
Pico	$hkl$	$d_{hkl}$ (Å)	Amostra 0%		
			$2\theta_{obs}$	$2\theta_{obs} - \Delta\theta$	$2\theta_{calc}$
1	00 $\bar{1}$	3,8835	23,105	22,8777	22,8809
2	01 $\bar{1}$	2,7573	32,693	32,4657	32,4442
3	011	2,7349	32,948	32,7207	32,7174
4	11 $\bar{1}$	2,2482	40,277	40,0497	40,0726
5	111	2,2240	40,741	40,5137	40,5275
6	00 $\bar{2}$	1,9417	46,998	46,7707	46,7439
7	01 $\bar{2}$	1,7424	52,777	52,5497	52,4724
8	012	1,7311	53,081	52,8537	52,8425
9	11 $\bar{2}$	1,5919	58,166	57,9387	57,8768
10	12 $\bar{1}$	1,5876	58,335	58,1077	58,0503
11	112	1,5747	58,781	58,5537	58,5690
12	02 $\bar{2}$	1,3786	68,154	67,9267	67,9351
13	022	1,3674	68,802	68,5747	68,5687
14 <sup>a</sup>	12 $\bar{2}$	1,2992	-	-	72,7270
15 <sup>a</sup>	003	1,2945	-	-	73,0320
16 <sup>a</sup>	22 $\bar{1}$	1,2945	-	-	73,0320
17	122	1,2852	73,891	73,6637	73,6464
18	03 $\bar{1}$	1,2311	77,664	77,4367	77,4670
19	013	1,2251	78,087	77,8597	77,9187
20 <sup>a</sup>	11 $\bar{3}$	1,1752	-	-	81,9040
21 <sup>a</sup>	13 $\bar{1}$	1,1718	-	-	82,1990
22 <sup>a</sup>	113	1,1649	-	-	82,7880
23	22 $\bar{2}$	1,1241	86,726	86,4987	86,5076
24	222	1,1120	87,891	87,6637	87,6860
25 <sup>a</sup>	02 $\bar{3}$	1,0811	-	-	90,8750
26 <sup>a</sup>	023	1,0731	-	-	91,7510
27	12 $\bar{3}$	1,0422	95,452	95,2247	95,3133
28	13 $\bar{2}$	1,0409	95,654	95,4267	95,4611
29	23 $\bar{1}$	1,0373	96,194	95,9667	95,9046
30	123	1,0313	96,859	96,6317	96,6446

Tabela 1. continuação

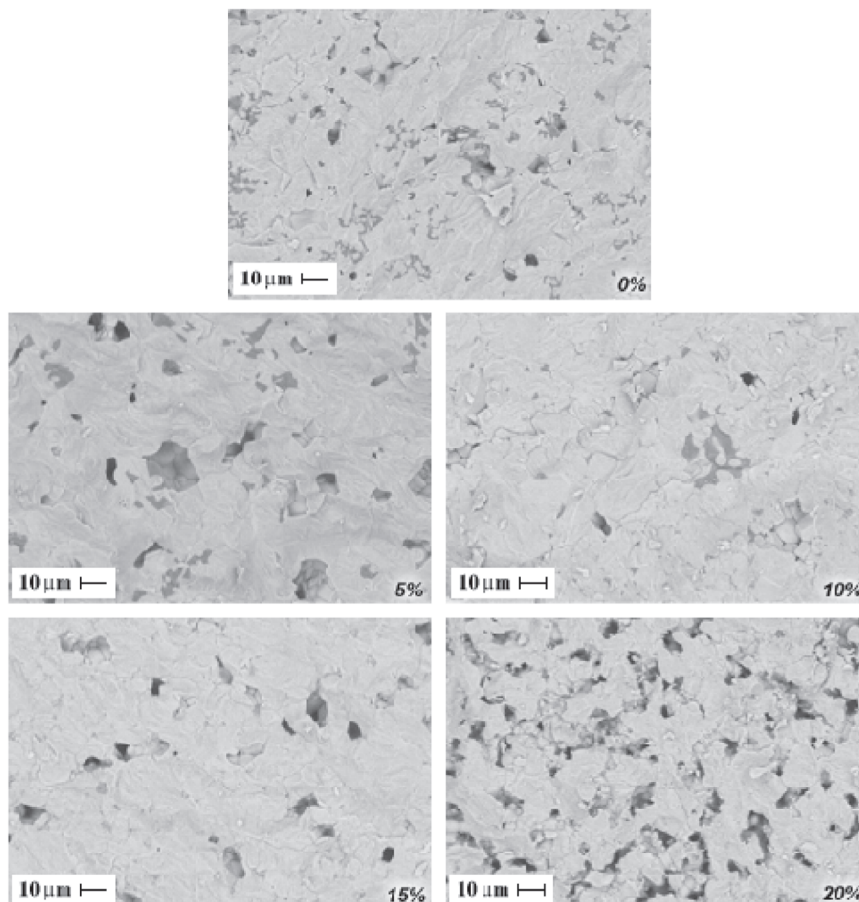
Pico	<i>hkl</i>	Amostra 5%			Amostra 10%				
		$d_{hkl}$ (Å)	$2\theta_{obs}$	$2\theta_{obs} - \Delta\theta$	$2\theta_{calc}$	$d_{hkl}$ (Å)	$2\theta_{obs}$	$2\theta_{obs} - \Delta\theta$	$2\theta_{calc}$
1	00 $\bar{1}$	3,8792	22,927	22,8629	22,9064	3,8781	22,915	22,8543	22,9127
2	01 $\bar{1}$	2,7542	32,560	32,4959	32,4810	2,7534	32,544	32,4833	32,4912
3	011	2,7319	32,828	32,7639	32,7543	2,7312	32,820	32,7593	32,7624
4	11 $\bar{1}$	2,2458	40,210	40,1459	40,1187	2,2451	40,175	40,1143	40,1309
5	111	2,2216	40,673	40,6089	40,5737	2,2212	40,647	40,5863	40,5826
6	00 $\bar{2}$	1,9396	46,889	46,8249	46,7984	1,9391	46,884	46,8233	46,8118
7	01 $\bar{2}$	1,7405	52,612	52,5479	52,5347	1,7400	52,603	52,5423	52,5515
8	01 $\bar{2}$	1,7292	52,975	52,9109	52,9049	1,7288	52,977	52,9163	52,9190
9	11 $\bar{2}$	1,5902	58,016	57,9519	57,9467	1,5897	58,022	57,9613	57,9660
10	12 $\bar{1}$	1,5858	58,186	58,1219	58,1203	1,5854	58,187	58,1283	58,1383
11	11 $\bar{2}$	1,5730	58,727	58,6629	58,6392	1,5727	58,717	58,6563	58,6533
12	02 $\bar{2}$	1,3771	68,074	68,0099	68,0204	1,3767	68,101	68,0403	68,0438
13	02 $\bar{2}$	1,3659	68,731	68,6669	68,6543	1,3656	68,741	68,6803	68,6731
14	12 $\bar{2}$	1,2978	72,883	72,8189	72,8173	1,2974	72,873	72,8123	72,8427
15 <sup>b</sup>	00 $\bar{3}$	1,2931	73,191	73,1269	73,1254	1,2927	73,223	73,1623	73,1485
16	22 $\bar{1}$	1,2931	73,191	73,1269	73,1254	1,2927	73,223	73,1623	73,1485
17	12 $\bar{2}$	1,2838	73,788	73,7239	73,7401	1,2835	73,806	73,7453	73,7586
18	03 $\bar{1}$	1,2297	77,636	77,5719	77,5683	1,2294	77,651	77,5903	77,5951
19	01 $\bar{3}$	1,2237	78,093	78,0289	78,0204	1,2234	78,104	78,0433	78,0438
20	11 $\bar{3}$	1,1740	82,033	81,9689	82,0107	1,1736	82,071	82,0103	82,0407
21	13 $\bar{1}$	1,1705	82,371	82,3069	82,3080	1,1702	82,433	82,3723	82,3358
22	11 $\bar{3}$	1,1636	82,956	82,8919	82,9021	1,1633	82,985	82,9243	82,9256
23	22 $\bar{2}$	1,1229	86,691	86,6269	86,6265	1,1226	86,720	86,6593	86,6581
24	22 $\bar{2}$	1,1108	87,884	87,8199	87,8062	1,1106	87,890	87,8293	87,8292
25	02 $\bar{3}$	1,0800	91,044	90,9799	90,9994	1,0796	91,087	91,0263	91,0346
26	02 $\bar{3}$	1,0719	91,947	91,8829	91,8834	1,0716	91,975	91,9143	91,9122
27	12 $\bar{3}$	1,0410	95,574	95,5099	95,4522	1,0407	95,581	95,5203	95,4905
28	13 $\bar{2}$	1,0398	95,708	95,6439	95,6002	1,0395	95,705	95,6443	95,6374
29	23 $\bar{1}$	1,0362	96,035	95,9709	96,0443	1,0359	96,145	96,0843	96,0783
30	123	1,0302	96,855	96,7909	96,7854	1,0300	96,871	96,8103	96,8141

Pico	<i>hkl</i>	Amostra 15%			Amostra 20%				
		$d_{hkl}$ (Å)	$2\theta_{obs}$	$2\theta_{obs} - \Delta\theta$	$2\theta_{calc}$	$d_{hkl}$ (Å)	$2\theta_{obs}$	$2\theta_{obs} - \Delta\theta$	$2\theta_{calc}$
1	00 $\bar{1}$	3,8764	22,895	22,8931	22,9228	3,8756	22,982	22,9375	22,9278
2	01 $\bar{1}$	2,7526	32,526	32,5241	32,5007	2,7524	32,603	32,5585	32,5038
3	011	2,7297	32,798	32,7961	32,7819	2,7287	32,890	32,8455	32,7933
4	11 $\bar{1}$	2,2444	40,165	40,1631	40,1449	2,2440	40,256	40,2115	40,1506
5	111	2,2195	40,656	40,6541	40,6132	2,2185	40,727	40,6825	40,6326
6	00 $\bar{2}$	1,9382	46,863	46,8611	46,8333	1,9378	46,956	46,9115	46,8441
7	01 $\bar{2}$	1,7394	52,587	52,5851	52,5693	1,7392	52,660	52,6155	52,5760
8	01 $\bar{2}$	1,7278	52,974	52,9721	52,9503	1,7273	53,050	53,0055	52,9683
9	11 $\bar{2}$	1,5892	58,014	58,0121	57,9840	1,5891	58,088	58,0435	57,9900
10	12 $\bar{1}$	1,5848	58,182	58,1801	58,1627	1,5845	58,250	58,2055	58,1740
11	11 $\bar{2}$	1,5716	58,715	58,7131	58,6968	1,5710	58,807	58,7625	58,7238
12	02 $\bar{2}$	1,3763	68,080	68,0781	68,0658	1,3762	68,152	68,1075	68,0731
13	02 $\bar{2}$	1,3648	68,733	68,7311	68,7184	1,3644	68,821	68,7765	68,7449
14	12 $\bar{2}$	1,2970	72,875	72,8731	72,8681	1,2969	72,954	72,9095	72,8772
15 <sup>b</sup>	00 $\bar{3}$	1,2922	73,223	73,2211	73,1853	1,2919	73,262	73,2175	73,2038
16	22 $\bar{1}$	1,2922	73,223	73,2211	73,1853	1,2919	73,262	73,2175	73,2038
17	12 $\bar{2}$	1,2826	73,818	73,8161	73,8180	1,2821	73,917	73,8725	73,8552
18	03 $\bar{1}$	1,2289	77,635	77,6331	77,6268	1,2288	77,711	77,6665	77,6400
19	01 $\bar{3}$	1,2228	78,099	78,0971	78,0922	1,2224	78,189	78,1445	78,1192
20	11 $\bar{3}$	1,1733	82,073	82,0711	82,0704	1,1732	82,123	82,0785	82,0808
21	13 $\bar{1}$	1,1697	82,364	82,3621	82,3765	1,1695	82,430	82,3855	82,3961
22	11 $\bar{3}$	1,1626	82,998	82,9961	82,9882	1,1622	83,079	83,0345	83,0259
23	22 $\bar{2}$	1,1222	86,689	86,6871	86,6943	1,1220	86,760	86,7155	86,7089
24	22 $\bar{2}$	1,1098	87,903	87,9011	87,9090	1,1093	88,002	87,9575	87,9597
25	02 $\bar{3}$	1,0793	91,051	91,0491	91,0691	1,0790	-	-	91,0990
26	02 $\bar{3}$	1,0710	91,962	91,9601	91,9794	1,0705	-	-	92,0370
27	12 $\bar{3}$	1,0404	95,525	95,5231	95,5264	1,0403	95,551	95,5065	95,5381
28	13 $\bar{2}$	1,0391	95,675	95,6731	95,6788	1,0390	95,727	95,6825	95,6951
29	23 $\bar{1}$	1,0354	96,109	96,1071	96,1362	1,0352	96,208	96,1635	96,1661
30	123	1,0293	96,884	96,8821	96,8995	1,0289	96,989	96,9445	96,9522



**Figura 1S.** Difratoogramas de raios-X das amostras de  $La_{0.86}Sr_{0.14}Mn_{1-y}Cu_yO_{3+d}$  após o quarto tratamento térmico. Os índices (hkl) da fase manganita, obtidos no processo de refinamento, encontram-se na Tabela 1S



**Figura 2S.** Imagens de MEV para as amostras de manganitas, formadas pela detecção de elétrons retroespalhados, com ampliação de 2.000´