

X-RAY ANALYSIS FOR THE TERNARY ZrO_2 - Y_2O_3 - Nb_2O_5 USED AS THERMAL BARRIER COATING

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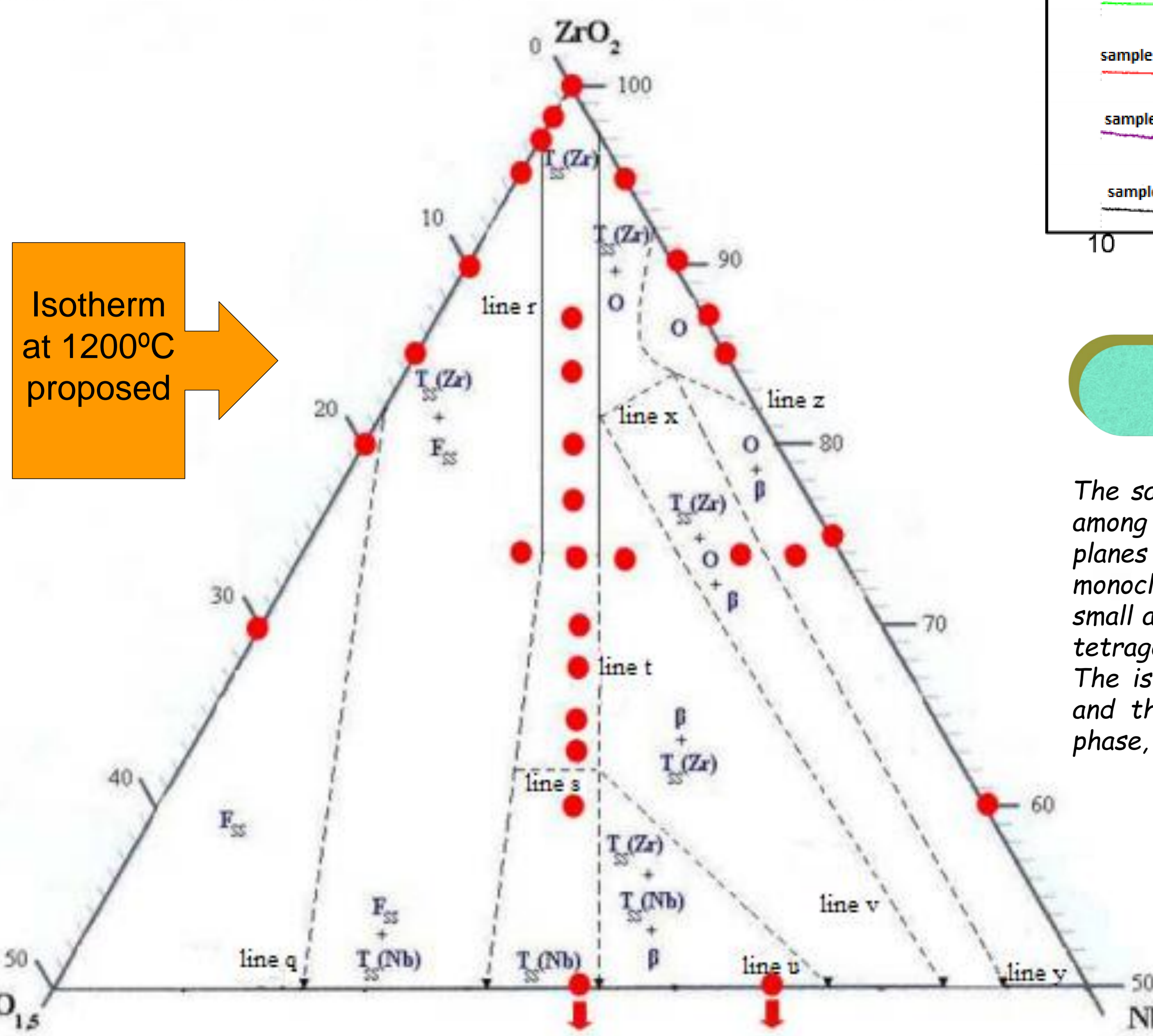
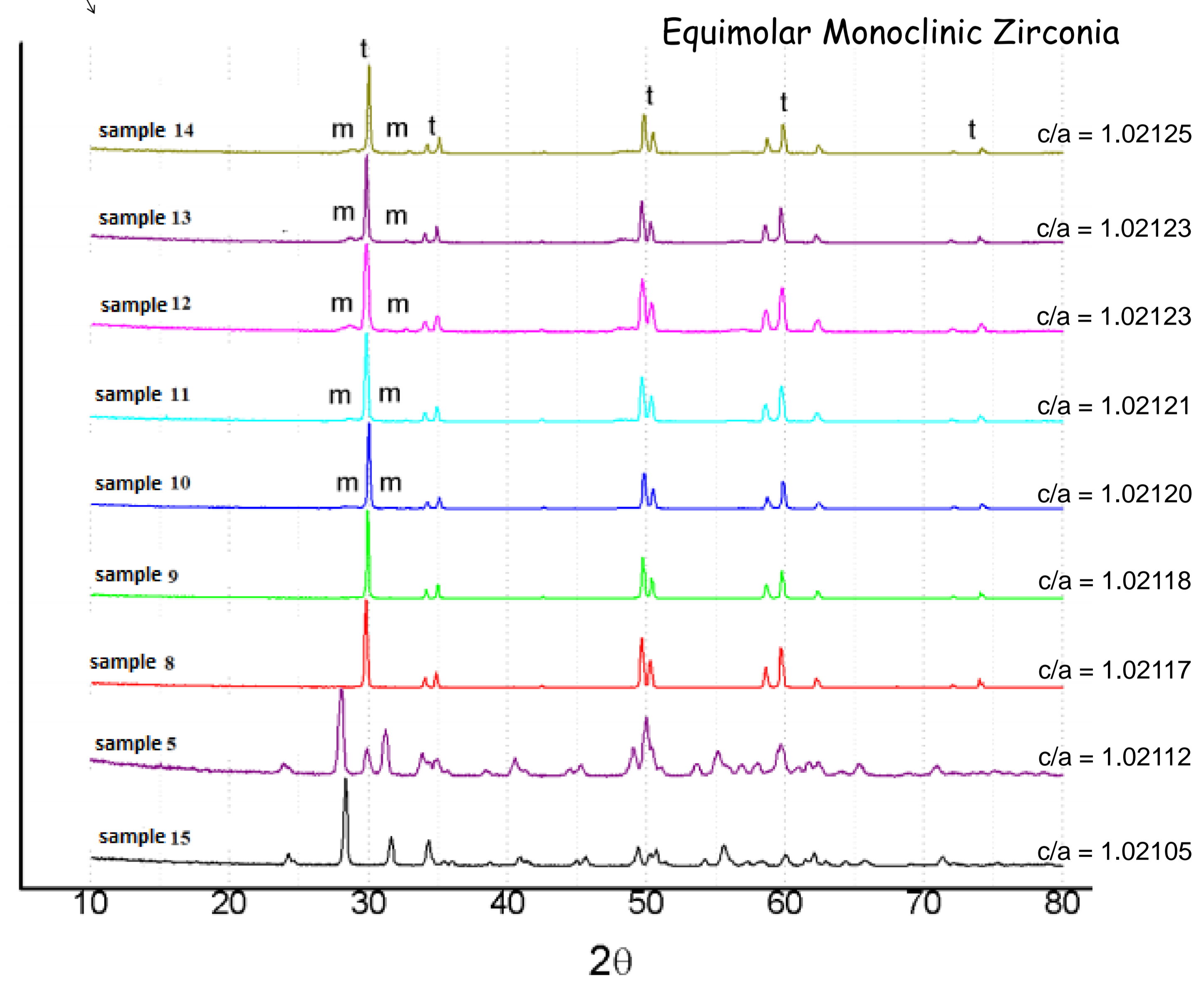
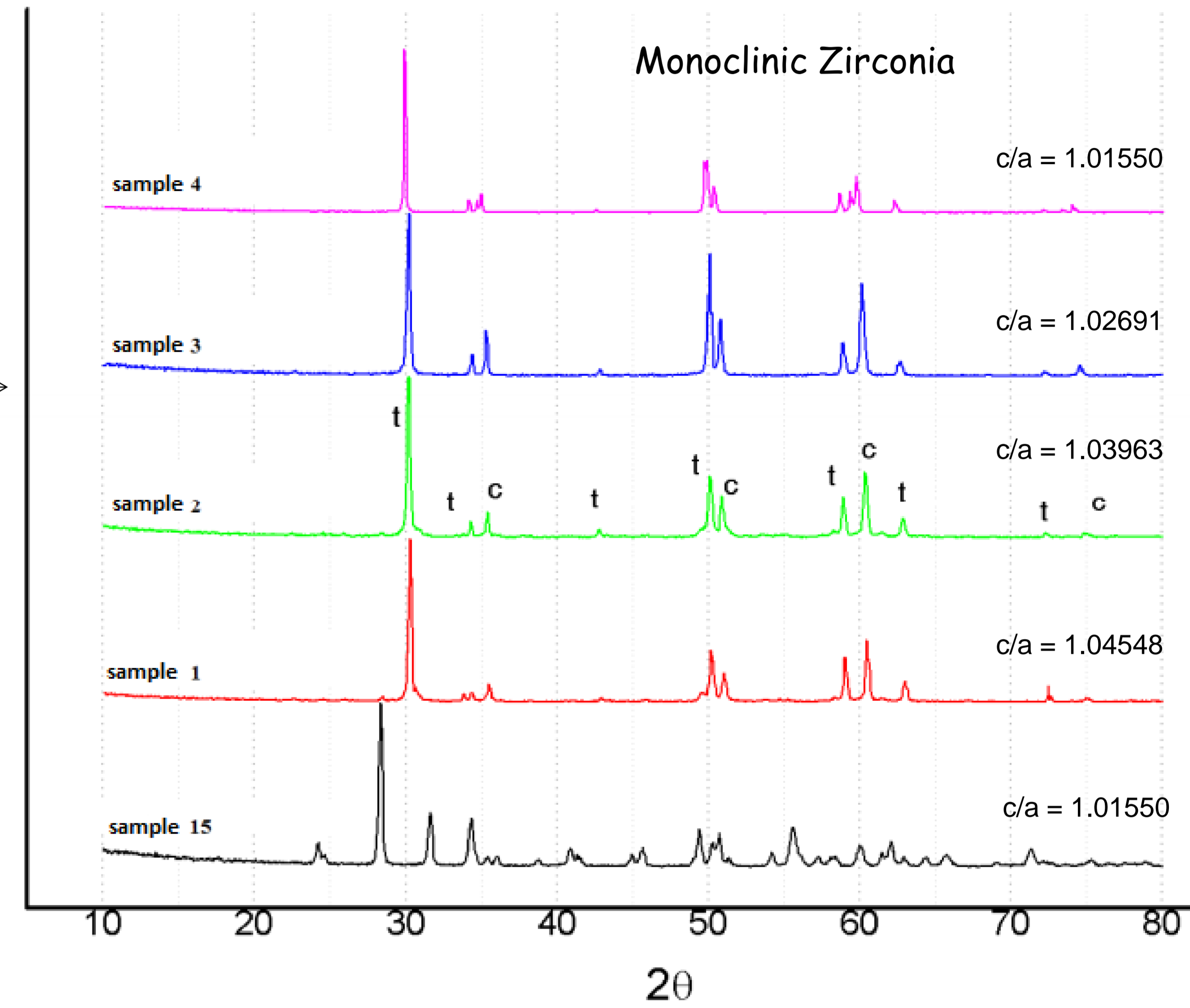
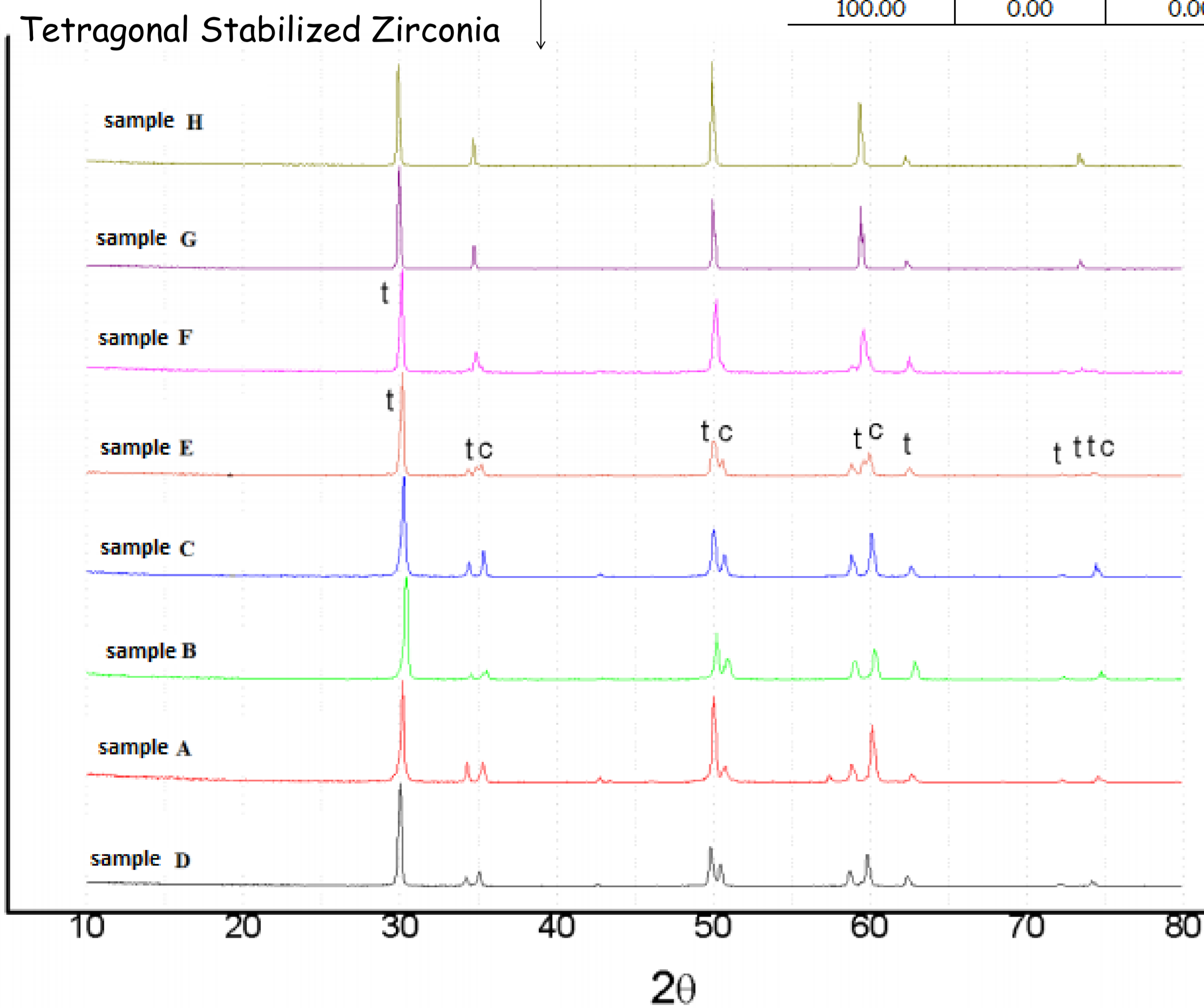
Abstract and Purpose

Ternary phase diagrams for ceramics are complex systems that require meticulous studies in order to assure a reliable qualitative and quantitative analysis. Thermal barrier coatings (TBCs) are used to protect the turbine underneath, which are made of super-alloys. It has been proved that yttria-stabilized-zirconia (YSZ) increases the life time of the turbine.

The higher presence of tetragonal phase guarantees better performance of the TBC, and it can be assured using a third oxide. Brazil is one of the greatest provider of niobium worldwide, that's why niobium oxide was chosen to be added at this system.

Amount of oxides in the samples (% molar)			Graphic Number
$ZrO_2 + Y_2O_3$	$YO_{1.5}$	$NbO_{2.5}$	
74.00	5.00	21.00	A
74.00	8.00	18.00	B
74.00	10.50	15.50	C
74.00	13.00	13.00	D
74.00	15.50	10.50	E
74.00	18.00	8.00	F
74.00	21.00	5.00	G
74.00	23.50	2.50	H

Amount of oxides in the samples (% molar)			Graphic Number
ZrO_2	$YO_{1.5}$	$NbO_{2.5}$	
74.00	2.50	23.50	1
74.00	5.00	21.00	2
74.00	10.50	15.50	3
74.00	15.50	10.50	4
87.00	6.50	6.50	5
84.00	8.00	8.00	6
80.00	10.00	10.00	7
77.00	11.50	11.50	8
74.00	13.00	13.00	9
71.00	14.50	14.50	10
68.00	16.00	16.00	11
65.00	17.50	17.50	12
63.00	18.50	18.50	13
60.00	20.00	20.00	14
100.00	0.00	0.00	15



Final Remarks

The sample $Zr_{74}Y_{15.5}Nb_{10.5}$ had the higher amount of tetragonal phase among the others. This conclusion was based on the ratio of c/a for planes (111) and (400), and by Rietveld method. The samples with monoclinic zirconia showed an overlap of cubic and tetragonal peaks at small angles. But the increase of dopants increase the percentage of tetragonal phase present.

The isotherm proposed represents the phase equilibrium at 1200°C and the best compositions, which guarantee exclusively tetragonal phase, are located between the lines r and t .

Acknowledgements

