

LIST OF FIGURES

Number	Figure captions	Page No.
1.1	Industry-wise refractory consumption	3
1.2	Crystal structure of graphite	6
2.1	The process flow diagram	44
2.2	Schematic of diffraction of X-rays by a crystal	46
3.1	BD-AP as a function of NCB addition	56
3.2	XRD patterns of A ₉ and S ₁₀	57
3.3	CCS of samples coked at 1400°C	58
3.4	Schematics of a brick sample	59
3.5	MOR of samples coked at 1400°C	60
3.6	Residual strengths of the samples	61
3.7	Schematic of the specimen geometry for oxidation resistance calculation	63
3.8 (a, b)	Distribution of carbon by elemental mapping of A ₉ , S ₁₀	64
4.1	XRD plot of gelation and co-precipitation processed CeSZ	70
4.2 (a-d)	XRD plots of 3h, 600 rpm milled Al, B ₄ C, Si and SiC	72
4.3	XRD pattern of samples coked at 1400°C for 3h.	73
4.4	Bulk density as a function of heat treatment conditions	74
4.5	CCS as a function of heat treatment conditions	75
4.6	Bending strength as a function of heat treatment conditions.	76
4.7 (a, b)	Carbon loss as a function of dwell time at 1300°C, 1500°C	77, 78
4.8 (a-d)	SEM of A2, B2, C2, D2 coked at 1400°C	81-83
4.9	TSR as %CMOR retention.	84
5.1	XRD plot of samples coked at 1400°C	89
5.2	CTE curve of specimens containing different antioxidants.	89

5.3	Apparent porosity of samples	90
5.4	Bulk density of samples	90
5.5	Variation in crushing strength with heat treatment.	91
5.6	Variation in bending strength with heat treatment	92
5.7 (a, b)	Isothermal oxidation profile at 1300°C, 1500°C	93, 94
5.8	Non-isothermal oxidation samples at 1100, 1300, 1500°C.	96
5.9	SEM of samples oxidized at 1500°C	97
5.10	Spalling resistance as % CMOR retention.	98
6.1	Thermal evolution of AMC4 specimen	102
6.2	XRD analysis of AMC sample coked at 1400°C with 3h soaking.	104
6.3	BD and AP of AMC refractories after curing at 200°C and coking at 1400°C.	106
6.4	Volumetric expansion and Permanent linear change after one heat cycle as a function of magnesia content	107
6.5	CTE behavior of different AMC refractories	108
6.6	Cold and Hot modulus of rupture of different AMC refractories.	110
6.7(a, b)	Microstructure of AMC4, AMC6	111, 112
7.1	DTA-TG of dried spinel precursor	116
7.2	XRD of gelation and precipitation processed spinel at 900°C	117
7.3	Expansion curves of AMC blocks	118
7.4	Cold Crushing strengths of samples coked at 1400°C	119
7.5	PLCR (%) of samples coked at 1400°C/3h for multiple cycles	120
7.6	Cold Crushing strengths of samples coked at 1400°C	121
7.7	Slag corroded samples coked at 1400°C	123
7.8	SEM, EDS and elemental line profile of AMC ₁	124

7.9	SEM, EDS and elemental line profile of AMCP	125
7.10	SEM, EDS and elemental line profile of AMCH	125