CHAPTER -5

(Study the pore size distribution, contact angle in different size of pores and kinetics of the porous structure at different solution treatments)

5.1 Pore size distribution

An Analytical Expression For Cumulative Pore Volumes And Pore Size Distributions

The minute opening -size allocation is the virtual profusion of apiece minute opening magnitude in a delegate degree of accuracy air. It can be signify in the midst of a gathering f(r), which has a assessment proportional to the mutual volume of all pores whose valuable radius is inside an insignificant variety centered on radius [West ,(2003)]. Maxwellian allocation are used at the same time as easily integrable, be deficient in adaptability in that the spread of the circulation of the most numerous pore size [Slovak, (2002)].

Figure 5.1 Micrometrics porositymeter

Measured Flow Rate: 20.00 mL STP/min

Signal Offset: 0.03667

Signal Inverted: No

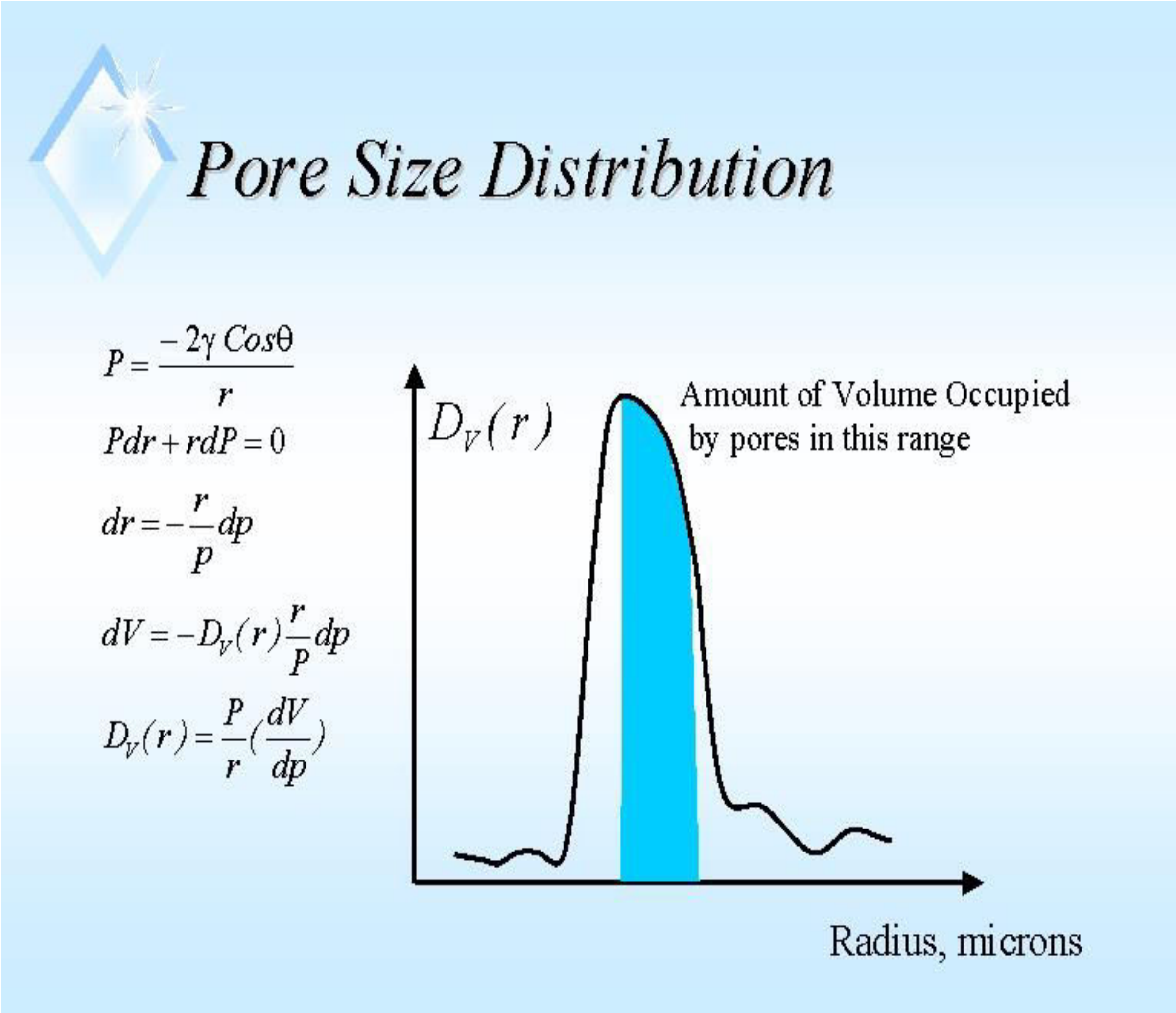


Figure 5.2 Normal cuve for pore size distribution

Figure 5.2 Normal distribution of pore size arrangement .The new-fangled equation (constants distinct in a while **P -** ***v0 = h tanh [k(R - TO)] and its derivative,*** dV/dR ***= hk sech [- T O)] , have obvious compensation*** larger than equations regularly worn to convey minute opening size distributions. It shows cumulative type pore size distribution. Comulative pore means amount of volume occupied of pore in this range.

Where

V = cumulative minute opening quantity of every single one pores encompass radii

2h = total minute opening capacity not including adsorption k = cause determining the sharpness of the distribution

TO = the largest part numerous pore radius

vo = snowballing pore volume of every single one pores having radii

Possesses wide resourcefulness in that the broaden

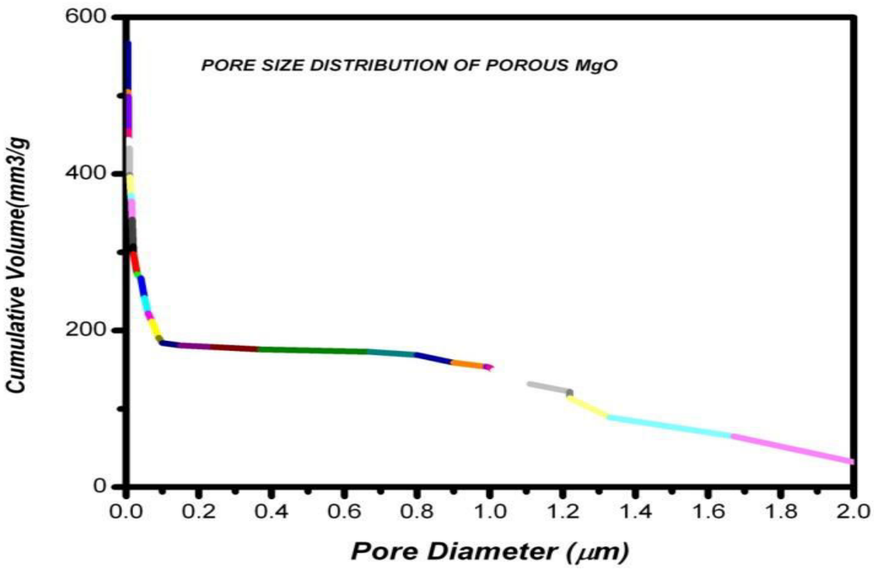


Figure 5.3 Pore size distribution of porous MgO without solution treatment

Figure 5.3 Shows some pore are greater than 1 micrometer where some pore are less than 1 micrometer .Comulative pore are in nano range are in greater range as comparison to micrometer range.

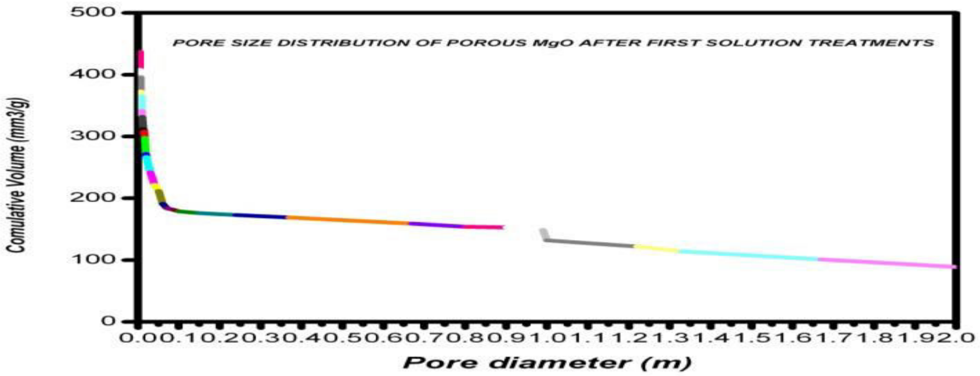


Figure 5.4 Pore size distribution of porous MgO First solution treatment

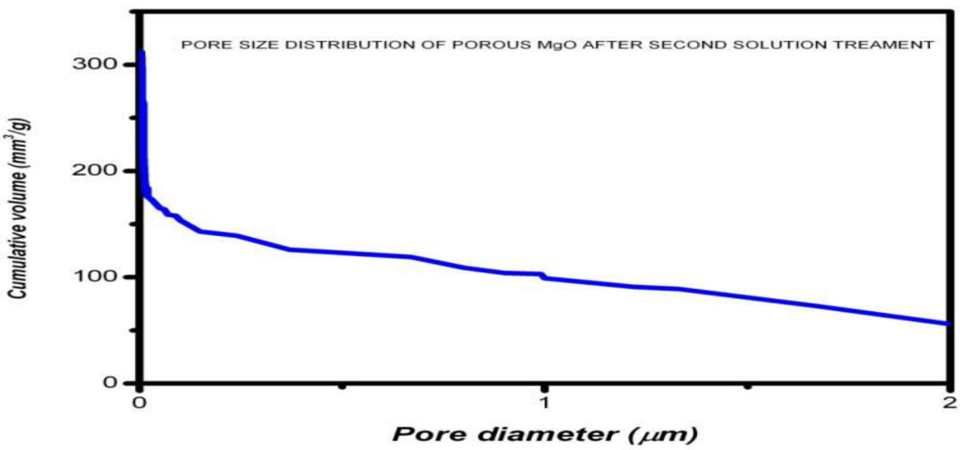


Figure 5.5 Pore size distribution of porous MgO second solution treatment

Figure 5.4 and 5.5 shows some pore are greater than 1 micrometer where some pore are less than 1 micrometer .Comulative pore are in nano range are in greater range as comparison to micrometer range . Figure 5.6 shows some pore are greater than 1 micrometer where some pore are less than 1 micrometer .Comulative pore are in nano range are in greater range as comparison to micrometer range. Figure 5.7 Shows pore diameter are in range of 0-2 micrometer .we also found some pore are in nano range.

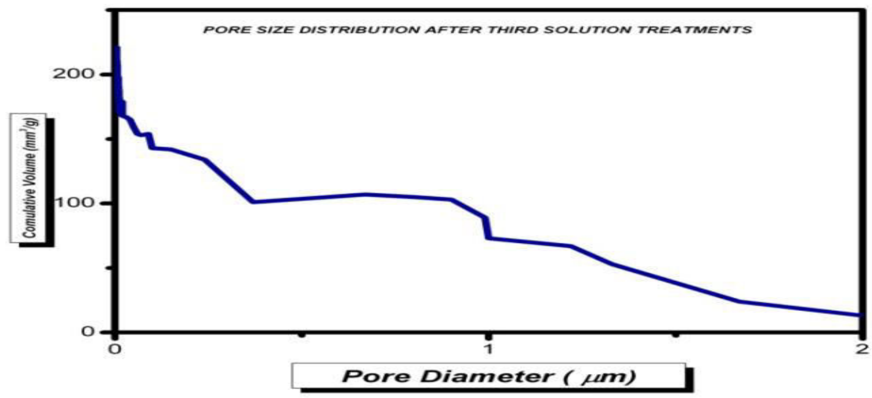


Figure 5.6 Pore size distribution of porous MgO third solution treatment

From the each solution treatment cumulative volume of 2 micron pore size are decreases because alumina transport are take place in this pore easily.

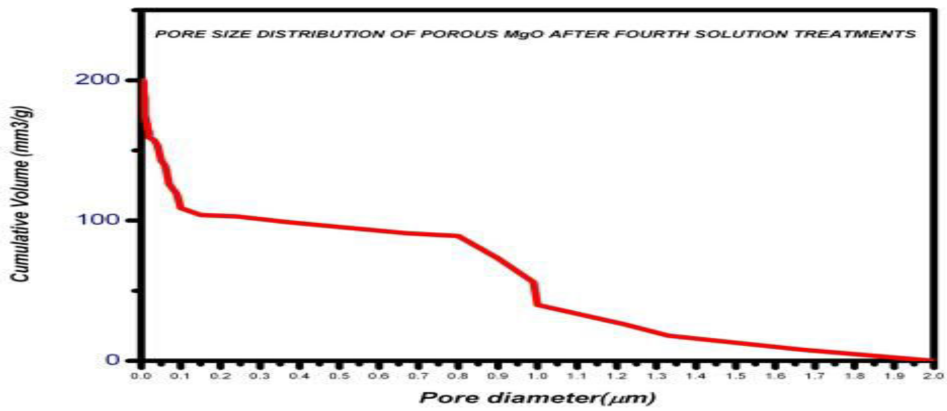


Figure 5.7 Pore size distribution of porous MgO fourth solution treatment

Figure 5.8 Shows some pore are greater than 1 micrometer where some pore are less than 1 micrometer .Comulative pore are in nano range are in greater range as comparison to micrometer range .Total pore size in range of 0-2 micrometer.

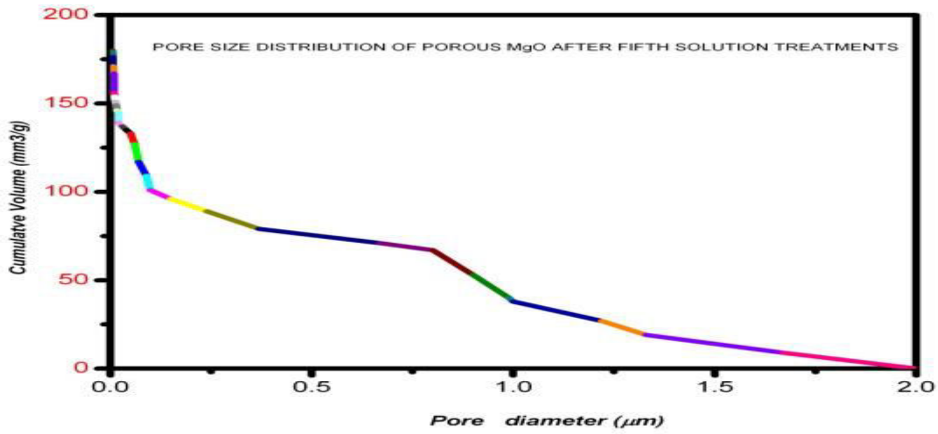


Figure 5.8 Pore size distribution of porous MgO fifth solution treatment

5.2 Kinetics of pore size distribution

Kinetics of pore means pore size distribution at different temperature range .From figure 5.9 shows accumulation of size of nano pore are increase with temperature as comparison to figure 5.8 (1300 ºC) because 2 micron pore change in nano size pore due to fulfilled by alumina transport.

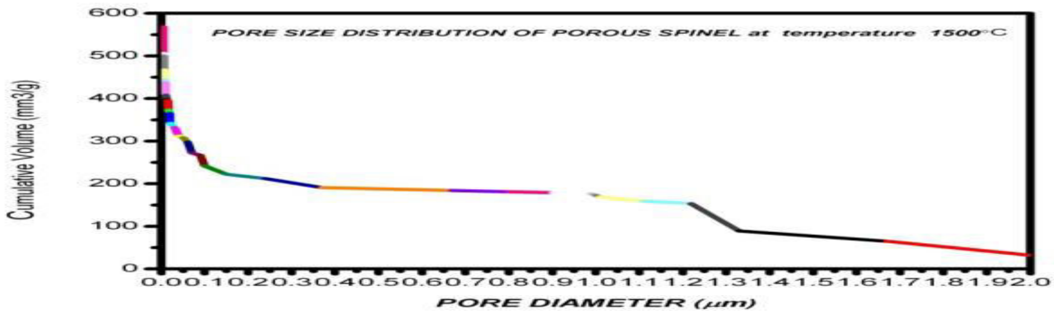


Figure 5.9 Kinetics of Pore size distribution of porous MgO fifth solution treatment

5.3 Porous Material in Recuperators in Glass tank Furnance

The constructive drawing finished in a cylindrical tube collection consists with Porous ceramics, which is establish in a vertical shaft padding with unmanageable material [West , (2003)] . From the Figure 5.10 The liveliness reduction of such recuperator is tremendously towering, we more often than not gauge that apiece 100°C of warmth of the ignition air, counterpart up to 5% of vigor saving.

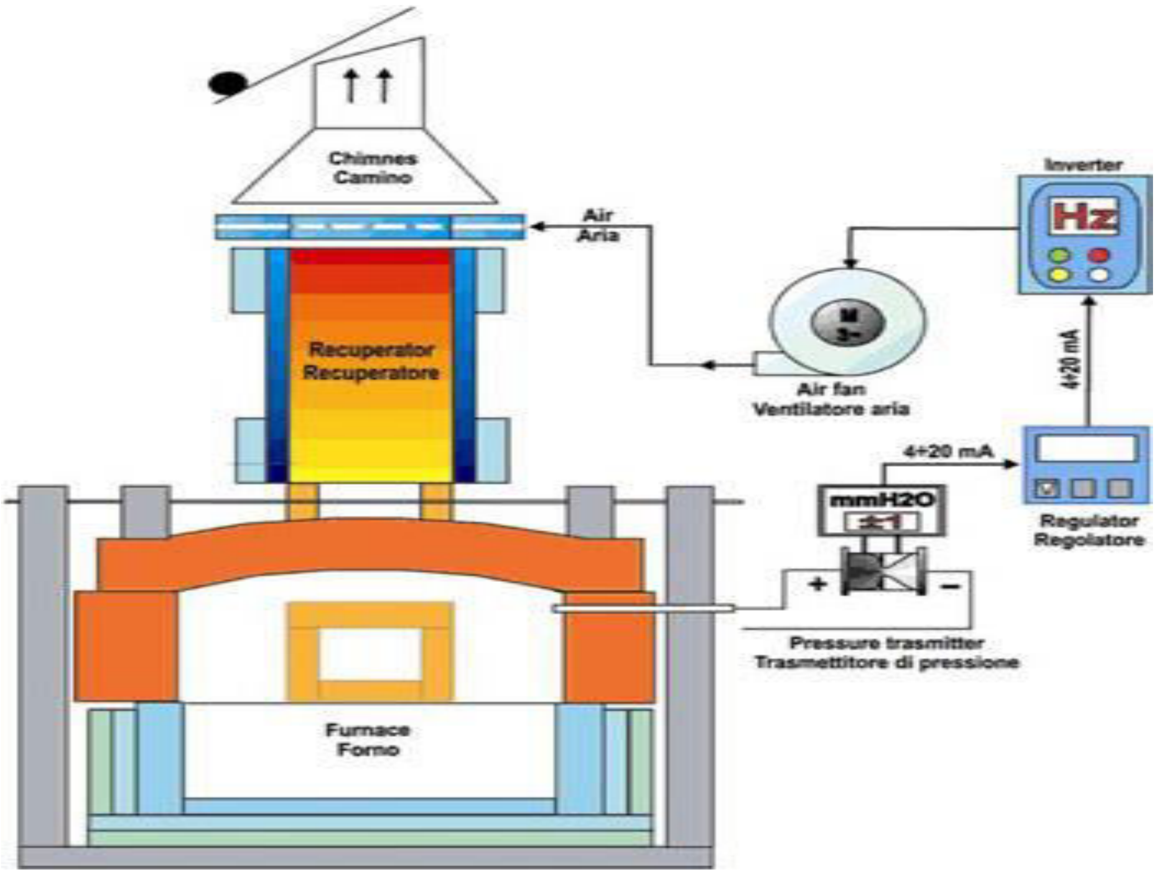


Figure 5.10 .Porous Material in Recuperators / Regenerators in Glass tank Furnance

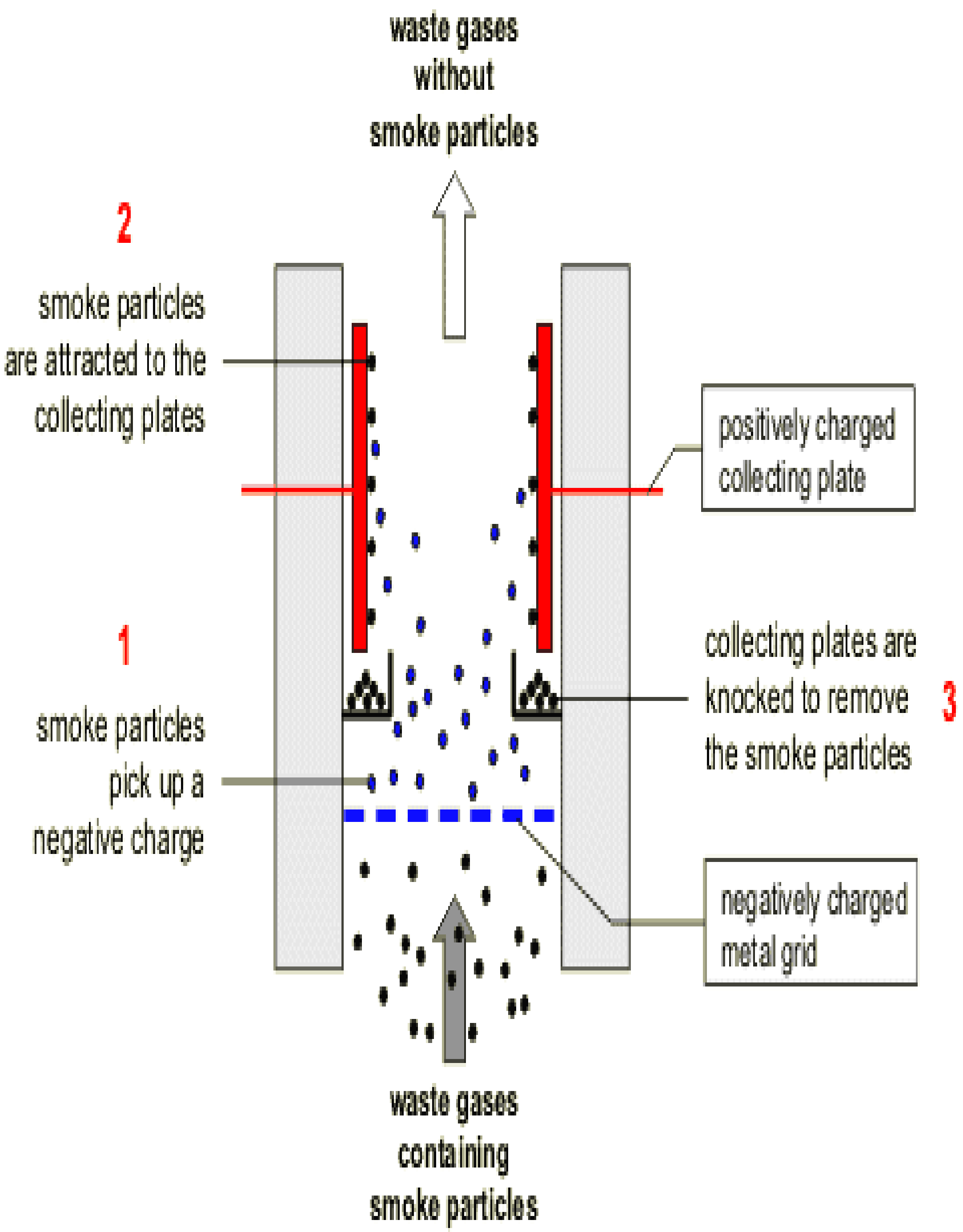


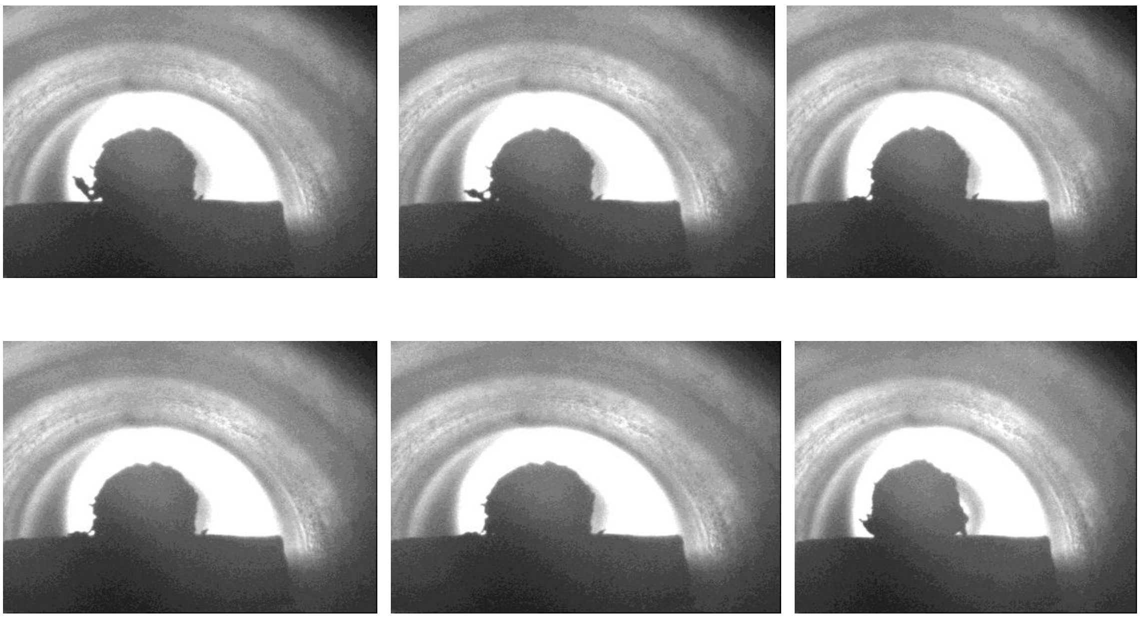
Figure 5.11 Chain Of Porous Material in Recuperators / Regenerators in Glass tank Furnance

From the Figure 5.11 A carrier house or stuff filter (SF) is an heavens toxic waste have power over appliance that get rid of particulates absent of air or chatter unconfined from profit-making processes or ignition for electricity production . An electrostatic precipitator

(ESP) is a ALTERATION piece of equipment so as to take away excellent particles, like grime and burn from a curving gas by means of the liveliness of an provoke electrostatic charge minimally impeding the flow of gases through the unit.

5.4 Drop-shape analysis

The focal apire of these research is after melting or before melting these rock-hard /liquid droplets fritter away passes from side to side the pores of absorbent substrate goes container house and in conclusion reaches ESP to air . Figure 5.12 Response of NOx on porous spinel on temperature 1100 C Shows some Nox are melt and passes through the pore of spinel.



No.	Age [h:m:s:ms]	Theta(M)[deg]
0-1	00:10:00:049	90.0 ± 22.11
0-2	00:02:00:029	90.0± 22.98
0-3	00:03:00:009	90.0 ± 23.76
0-4	00:25:00:002	90.0 ± 31.83
0-5	00:32:59:996	90.0±32.34
0-6	00:48:59:980	91.9 ± 44.93

Figure 5.12 Response of NOx on porous spinel on temperature 1100C

5.5 IL Water and NIL

Table 5.1 Measurement of Relaxation process in different solution treatment with O.1M NaCl

Sample	External solution	Time (sec)	BD (gm/cc)	I,number of relaxation process	IL (%)	NIL (%)
PMSO	0.1M NaCl	7	1.9	1,2,3	39	---
PMS1	0.1M NaCl	14	2.0	1,2	42	---
PMS2	0.1M NaCl	21	2.25	1,2,3	45	---
PMS3	0.1M NaCl	28	2.27	1,2	47	---
PMS4	0.1M NaCl	35	2.34	1,2	49	---
PMS5	0.1M NaCl	42	2.46	1,2,3	51	1

Table 5.2 Measurement of Relaxation process in different solution treatment with O.2 M NaCl

Sample	External solution	Time (sec)	BD (gm/cc)	I,number of relaxation process	IL (%)	NIL (%)
PMSO	0.2M NaCl	49	1.9	1,2,3	41	---
PMS1	0.2M NaCl	56	2.0	1,2	44	---
PMS2	0.2M NaCl	63	2.25	1,2,3	46	---
PMS3	0.2M NaCl	70	2.27	1,2	49	---
PMS4	0.2M NaCl	77	2.34	1,2	53	---
PMS5	0.2M NaCl	44	2.46	1,2,3	55	1

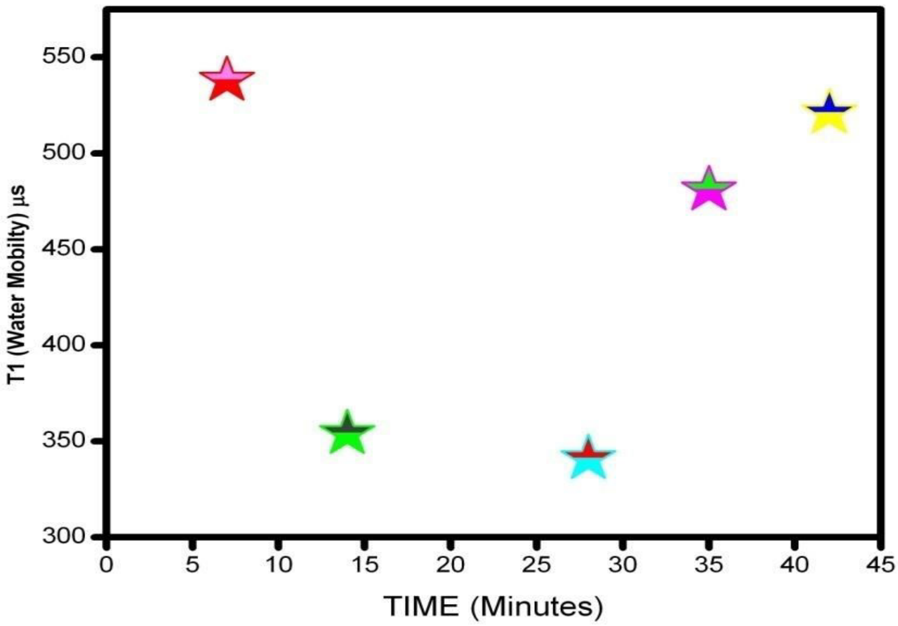


Figure 5.13 Water mobility of porous MgO with different solution treatment

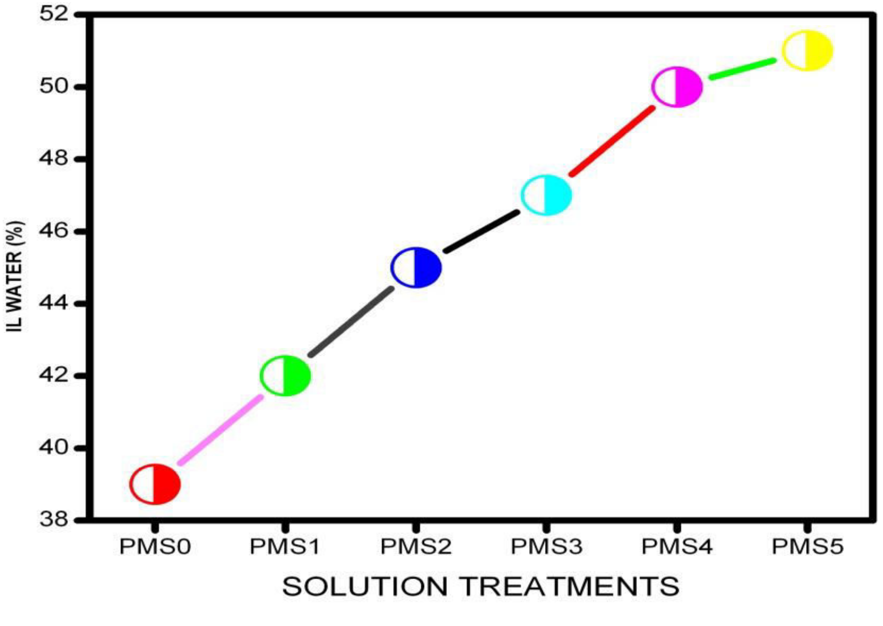


Figure 5.14 Percentage of IL Water of porous MgO with different solution treatment

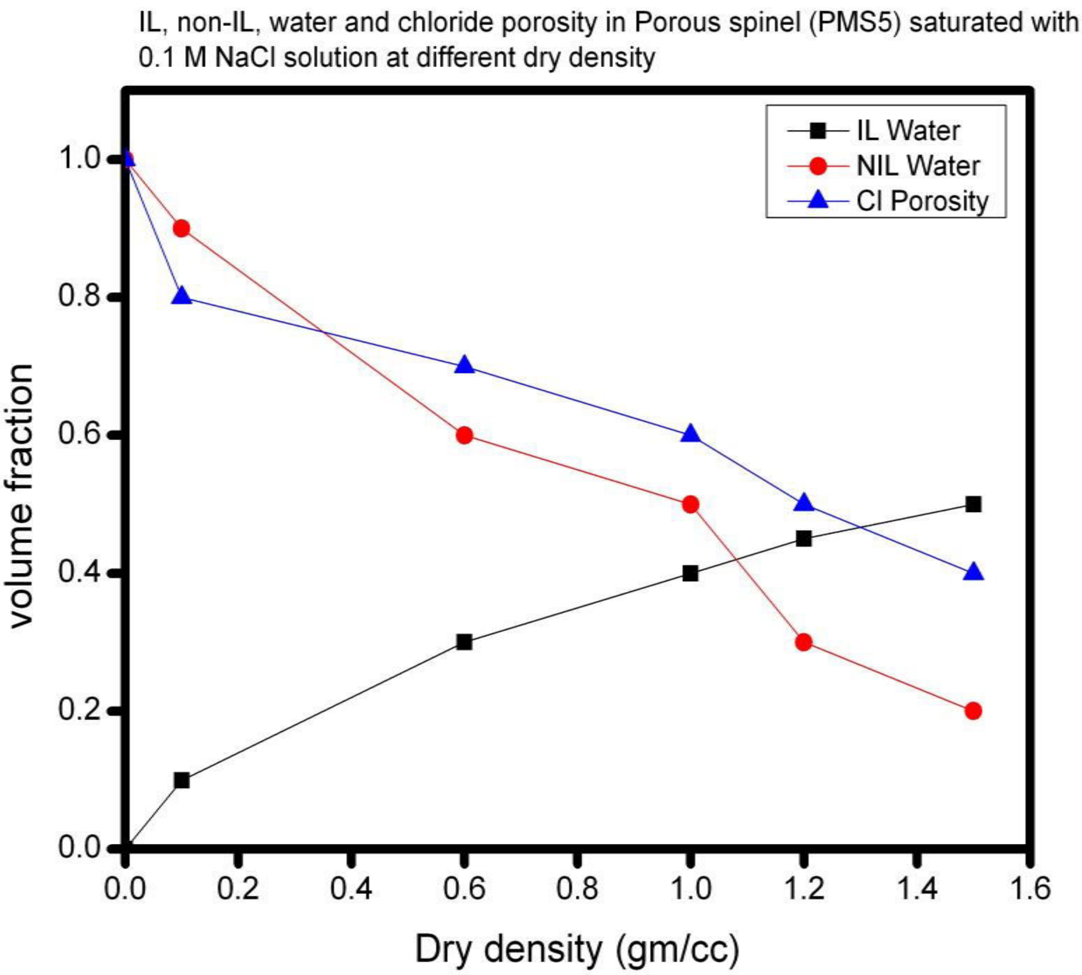


Figure 5.15 volume fraction of porous spinel with Cl addition.

From the Figure 5.13 shows PMSO have a maximum mobility and from Figure 5.14 shows PMS5 were maximum IL water Percentage and Figure 5.15 shows the attendance the absorbent in PMS5 samples as a occupation of the waterless density. appraisal of the IL and non-IL porosities in the PMS5 is foundation only on the NMR dimensions . The model curves seen in the Figure 5.15 are based on an assumed quantity of layers per mountain at towering density, PMS5 has worse IL porosity than Cl due to lower IL swelling, in toting up to the chloride porosities be superior than in NIL.

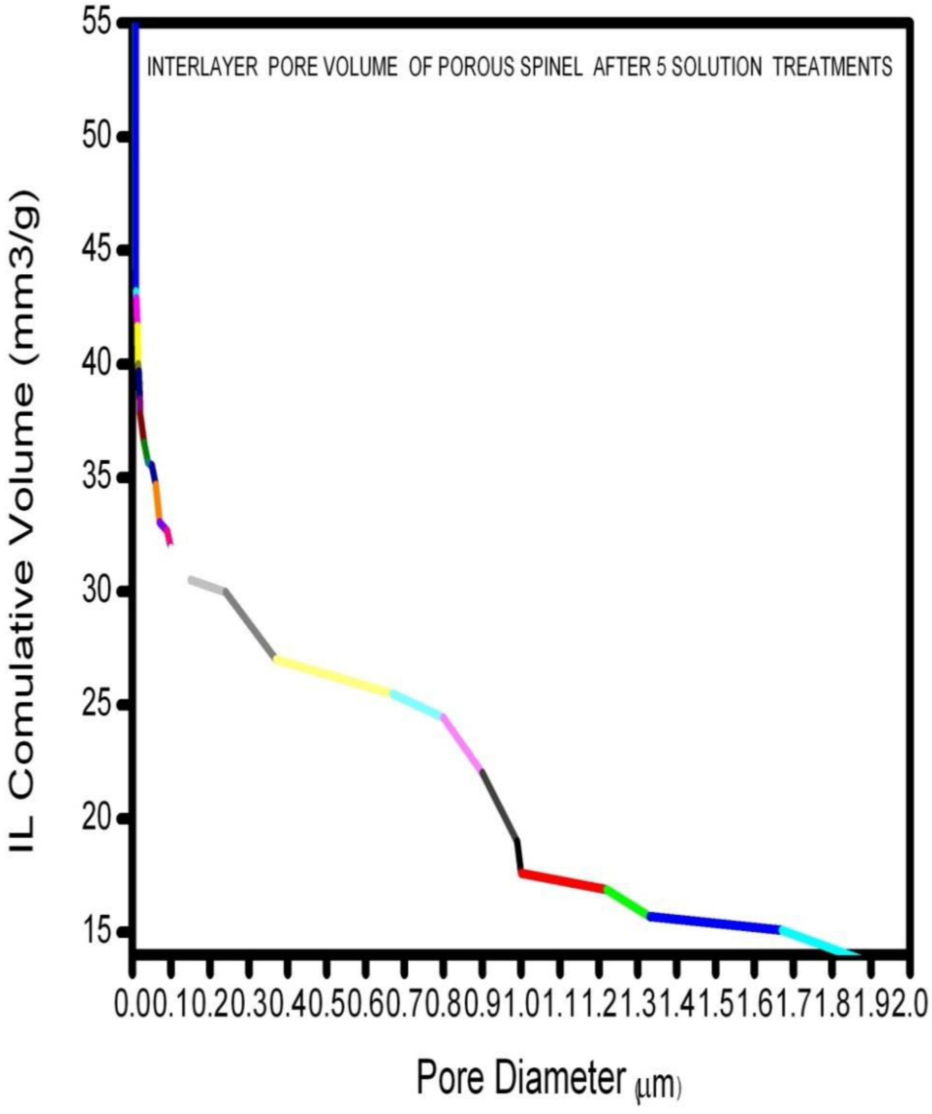


Figure 5.16 IL pore volume of porous MgO after 5 solution treatment

From the Figure 5.16 it is clear that some interlayer pore are less than micrometer were as some pore are greater than micrometer range.

5.6 Failure analysis-

Invention Maturity • Avoid invention fault • indemnify merchandise being • avert shelter vulnerability though by means of the creation .Figure 5.17 shows failure mechanism for analysis of failure.

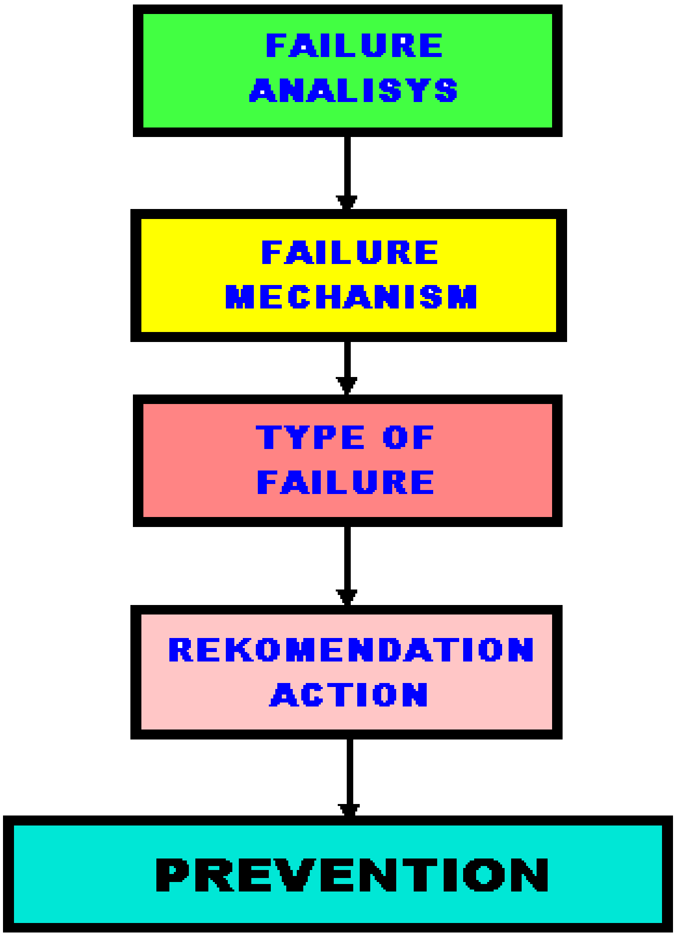


Figure 5.17 Failure mechanism for analysis of failure

Table 5.3 Failure Mode effect analysis template-Minimize Error 6 mol % Solution

Process function	Failure mode	Cause of failure	effect	Product	Probability Of Failure occurences
1.Hydraulic	crack	over pressure	loss of operation	total -10 crack-2	2/10=.2
2.Solution Preparation	leak	Weathering	loss of operation	Total -10 Crack-1	.1
3.Thermal shock	crack	Human error ,weathering	loss of operation	total -10 crack-4	.4
4.Bulk Density ,Apparent Porosity	crack	dissolve	loss of operaton	total-10 Crack-2	.2
5.Compressive-strength	crack	machine	loss of operation	Total-20 Crack-1	.05
6.Solution dipped	crack	weathering	loss of operation	Total-20 Crack-2	.1

Table 5.4 Failure Mode effect analysis template-Minimize Error for 8 mol% Solution

Process function	Failure mode	Cause of failure	effect	Product	Probability Of Failure occurences
1.Hydraulic Pressure	crack	over pressure	loss of operation	total -10 crack-3	.3
2.Solution Preparation	leak	Weathering	Loss of operation	Total -10 Crack-2	.2
3.Thermal shock	crack	Human error ,weathering	loss of operation	total -20 crack-5	.25
4.Bulk density ,Apparent porosity	crack	dissolve	Loss of operaton	total-10 Crack-2	.2
5.Compressive-strength	crack	machine	loss of operation	Total-20 Crack-2	.1
6.Solution dipped	crack	weathering	Loss of operation	Total-20 Crack-3	.15

Table 5.5 Failure Mode effect analysis template-Minimize Error for 10 mol% Solution

Process function	Failure mode	Cause of failure	effect	Product	Probability Of Failure occurences
1.Hydraulic	crack	over pressure	loss of operation	total -10 crack-3	.3
2.Solution Preparation	leak	Weathering	Loss of operation	Total -10 Crack-4	.4
3.Thermal shock	crack	Human error ,weathering	loss of operation	total -20 crack-8	.25
4.Bulk Density ,Apparent porosity	crack	dissolve	Loss of operaton	total-10 Crack-3	.3
5.Compressive-strength	crack	machine	loss of operation	Total-20 Crack-2	.1
6.Solution dipped	crack	weathering	Loss of operation	Total-20 Crack-3	.15

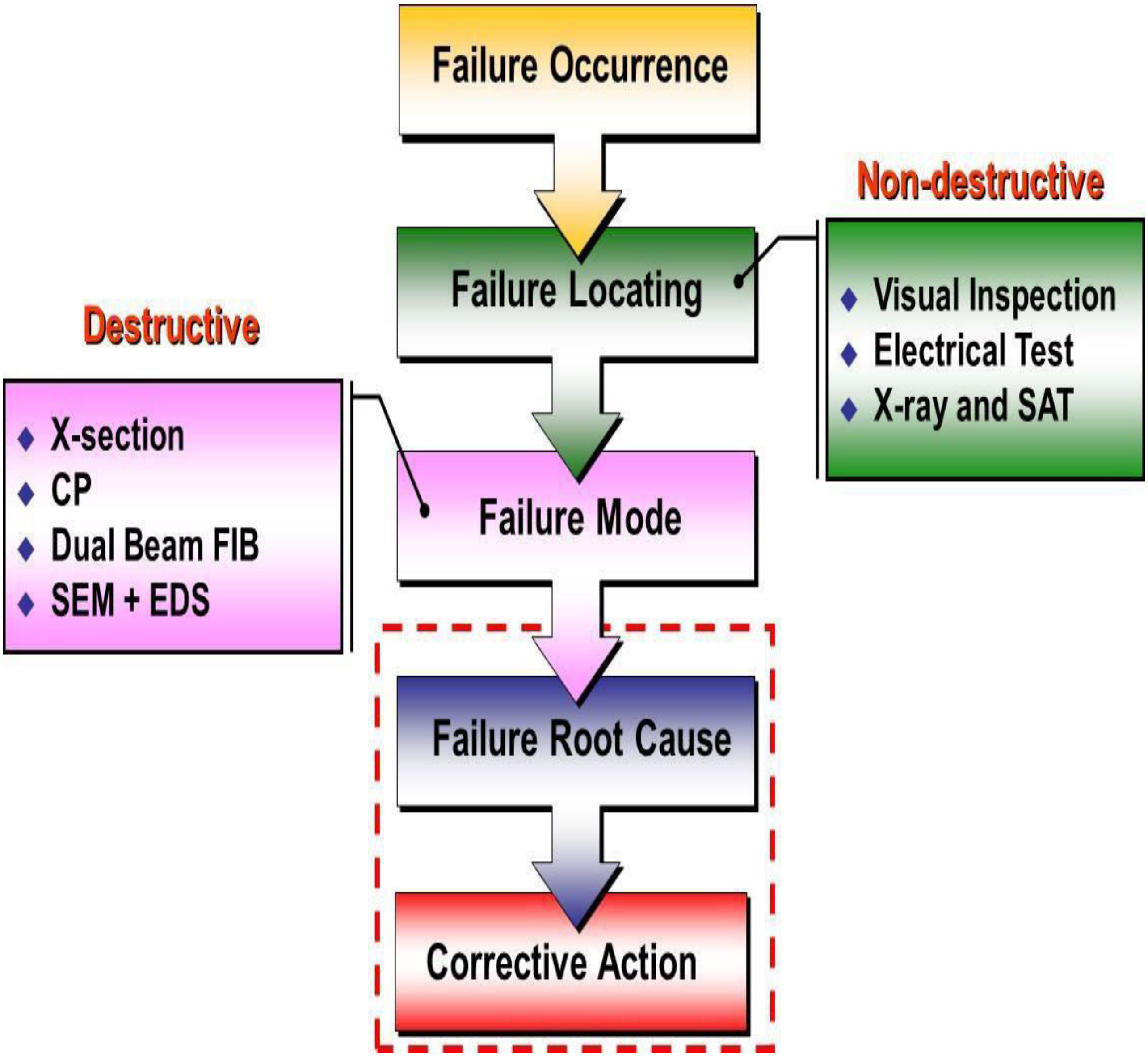


Figure 5.18 Failure lessening instrument for analysis of failure reduction

Figure 5.18 Shows the mechanism for reducing the failure mode by destructive action. Due to proper arrangement of SEM ,EDS,XRD we can reduce the error by reducing impurity in a materials.

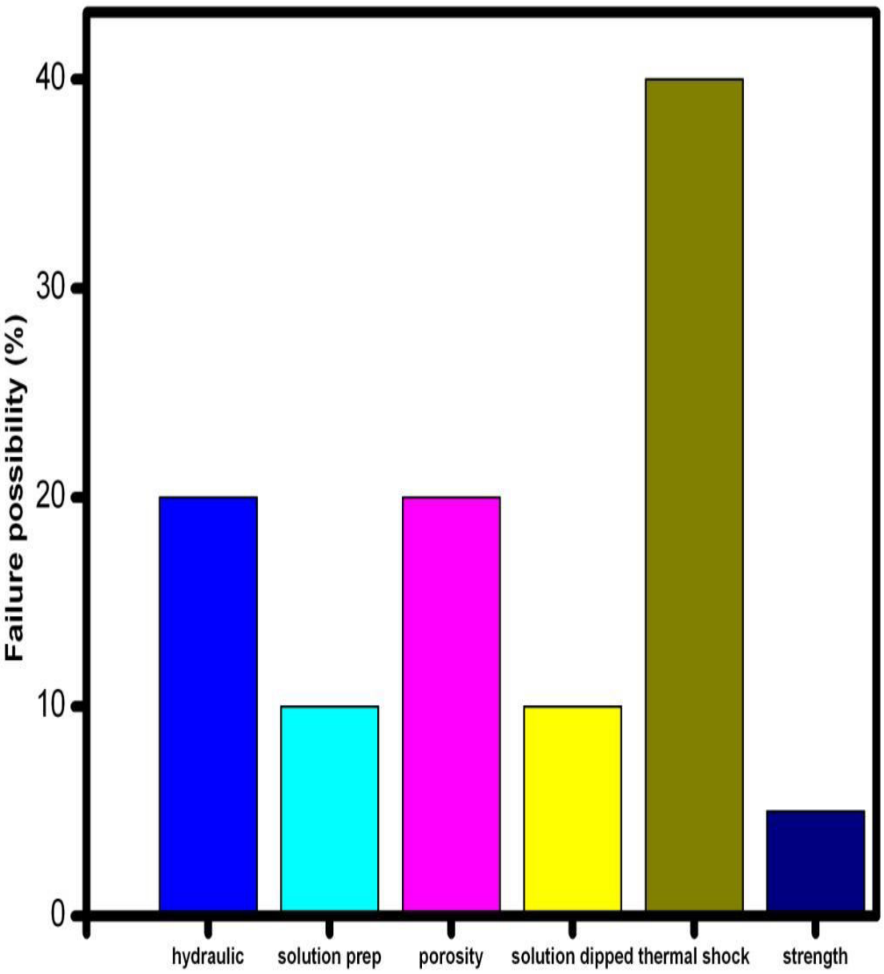


Figure 5.19 Failure possibility for differment measurement

From the Figure 5.19 It is clear that Possibility of failure is maximum for measurement in Thermal shock resistance and minimum for strength measurement.