

GUJARAT TECHNOLOGICAL UNIVERSITY

CHEMICAL TECHNOLOGY (36)

CERAMIC COATINGS

SUBJECT CODE: 2163607

B.E. 6th SEMESTER

Type of course: Chemical Technology

Prerequisite: The students should have a clear concept on basic chemistry, geology and Mineralogy that will help them to have an easy grasp of the subject and GC05.

Rationale: The main objective of this subject is to offer an overview over the fundamentals and basics of ceramic coating materials, their manufacturing processes, the raw feed materials for batch preparation, their availability, their properties, their beneficiation processes, process of recovery and their application.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks						Total Marks
L	T	P		Theory Marks			Practical Marks			
			ESE (E)	PA (M)		ESE (V)		PA (I)		
				PA	ALA	ESE	OEP			
4	0	3	7	70	20	10	20	10	20	150

Content:

Sr. No.	Content	Total Hrs.	% Weightage
1	Advantages of ceramic coating with respect to organic coatings. Different types of ceramic coatings : i) Thermal barrier coating, ii) High emissivity refractory coating	10	20
2	Characteristics of different types of ceramic coating. Raw Materials, Composition of different types of coating, Processing of the raw materials, Frit preparation, Milling, Preparation of enamel slip.	10	20
3	Metal surface preparation before coating. Different theories of adherence Wetting of metal by glass Theory of opacity and treatment of opacifying agents	10	20
4	Application of coatings on metal surfaces. Drying and firing of coating.	10	20
5	Different coating defects and remedial measures. Special types of coatings. Testing & quality control of coating.	10	20

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
17	50	18	7.5	7.5	00

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Reference Books:

1. Technology of enamels – V. V. Vargin
2. Vitreous Enamel: A guide to modern enameling practice – K. A. Maskall & D. White

Course Outcome:

1. To express their technical knowledge over fundamentals of the subject
2. To choose batch composition for different glasses and ceramic products.
3. To be able to utilize their knowledge and skills for the preparation of other related highly technical subjects in the Glass & Ceramic Technology course curriculum
4. To be able to apply this knowledge in their higher study, research work with related technical subjects.
5. To build a bridge between theoretical and practical concept used in industry

List of Experiments:

1. Metal surface preparation – cleaning, pickling, Ni dipping and neutralization.
2. Formation and melting of enamel frits, compounding of a recipe of enamel slip with frit, opacifiers and other additions, melting.
3. Sieve analysis of wet milled and dry milled enamels.
4. determination of consistency of enamel slip
5. Application of enamel by dipping, spraying
6. Firing of enamel wares.
7. Study of defects of enameled ware
8. Testing of vitreous enamel wares
9. Test of resistance to boiling water
10. Test for warpage and Test for abrasion resistance

Design based Problems (DP)/Open Ended Problem:

Students are free to select any area of science and technology based on chemical technology applications to define Projects.

1. Industrial practices for synthesizing thermal barrier coating
2. Industrial practices for synthesizing emissivity refractory coating
3. Industrial practices for preparing enamel slip
4. Industrial practices for preparing frit
5. Industrial practices for firing technique of unfired coating material

List of Open Source Software/learning website:

1. Literature available on internet
2. Glass & Ceramic dictionaries
3. Delnet
4. Literature available under R&D in Ceramic & Glass industry.
5. Ceramic & Glass journals

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.