

M. Phil. Physics (Academic Year 2006-2007)

Paper-III

Fuel Cell Technology

<u>Unit-I</u>	<u>Introduction:</u>	7
Fuel cell definition, historical developments, working principle of fuel cell, components of fuel cell, EMF of the cell and general performance characteristics, Types of fuel cells, Advantages and disadvantages of fuel cells.		
<u>Unit-II</u>	<u>Solid Oxide Fuel Cells:</u>	7
Thermodynamic principles, fuel cell efficiency, Classification of Solid Oxide fuel cells (SOFCs): Design, operating temperature and support. Components of SOFC, Cell operation and performance.		
<u>Unit-III</u>	<u>Solid Electrolytes with Oxygen Ion Conduction:</u>	6
Ionic conductivity, Oxygen ion conducting materials, role of defect structures in electrical conduction: Defect structure of doped and undoped metal oxides. Oxygen ion conducting materials for oxygen sensors.		
<u>Unit-IV</u>	<u>Electrodes for Solid Oxide Fuel Cells:</u>	6
Anode: Requirements, anode kinetics, Triple-phase-boundary (TPB), materials. Cathode: Requirements, cathode kinetics, materials		
<u>Unit-V</u>	<u>Applications of Fuel Cells:</u>	6
Fuel cell power plants: fuel processor, fuel cell power section (fuel cell stack), power conditioner; automotive applications, portable applications		
<u>Unit-VI</u>	<u>Techniques for development of SOFC materials:</u>	8
Solid-state synthesis, Combustion route, Material synthesis in thin-thick film form by spray pyrolysis, screen printing.		

References:
Essential

1. Fuel cell technology handbook, edited by Gregor Hoogers, CRC Press 2003
2. Handbook of Batteries and Fuel cell, David Linden, McGraw-Hill Book Company
3. High-temperature Solid Oxide Fuel Cells: Fundamentals, Design and Applications, S.C. Singhal, Elsevier Publications, 2003

Desirable

1. Non-stoichiometry, Diffusion and Electrical conductivity in binary metal oxides, P. Kofstad, Wiley-Interscience, New York, 1972.
2. Science and Technology of Ceramic Fuel Cells, 2nd Edition , Nguyen Minh, Elsevier Publications, 2007

To,
The Chairman,
BOS,
Shivaji University, Kolhapur.

Sub: Introduction of new paper

Respected Sir,

My students, working for M.Phil. and Ph.D., will now be appearing for M.Phil. and pre-Ph.D. examinations. I am enclosing herewith the syllabus of Paper-III related to their research problem for academic year 2006-2007. Further changes in copy of the syllabus are made as per your suggestions.

It may please be approved.

Thanking you.

Yours Sincerely,

Dr. (Smt.) Lata D. Jadhav

Forwarded through Head, Dept. of Physics.