



UNIVERSITÀ
degli STUDI
di CATANIA



DIPARTIMENTO DI FISICA E ASTRONOMIA
“ETTORE MAJORANA”

DOTTORATO DI RICERCA IN
SCIENZA DEI MATERIALI E NANOTECNOLOGIE
XXXV CICLO

Electrochemical methods applied to nanomaterials

(3 CFU: 7h theory + 30h labs)

Teaching staff: prof. S. Mirabella
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lecture period: June 2024
Lecture room:

PROGRAMME OF THE COURSE

Basic Electrochemistry

- Electrochemical cells, Nernst equations
- Standard potentials, Reference electrodes
- Kinetics and energetics of electrode reactions
- Butler-Volmer equations
- EC methods: CA, LCCV, CV, SWV
- Electrochemical impedance spectroscopy, Randles circuit model

Solid-liquid interface at nanoscale

- Metal-electrolyte interface (equilibrium and non-equilibrium processes)
- Semiconductor-electrolyte interface: Gerischer model (energy band scheme)
- Mott-Shottky methods
- Hydrogen and Oxygen evolution reactions
- Energy storage: batteries and capacitors
- Pulsed electrodeposition
- Quantum electrochemistry

Laboratory experience

- Water splitting cell
- Supercapacitors
- Electrodeposition

BIBLIOGRAPHY

- K. B. Oldham, J. C. Myland – Fundamentals of Electrochemical Science – Academic Press
- A. Bard, L. Faulkner - Electrochemical Methods, Fundamentals and Applications – John Wiley & Sons