



Seminario

EIS Analysis using Genetic Programming: ISGP

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**Aula “I. Sorgato” (ICH1)
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Electrochemical impedance spectroscopy (EIS) data analysis with a MATLAB-based in-house program using genetic programming will be discussed. The physical phenomena underlying the resulting data in EIS are related to the relaxation times in the sample. The inverse problem of finding the distribution function of relaxation times (DFRT, a.k.a. DRT) is demanding. We have developed a modified Genetic Programming (GP) method for this task. It gives a *functional form* of the DFRT in the sample. The most important part of the evolutionary force, drag the population of solutions toward lowering the discrepancy between the modeled and the measured data while keeping the DFRT simple. The program seeks DFRT with the form of a peak or a sum of several peaks, assuming the Debye kernel, $(1+j\omega t)$. All the peaks are known functions. By finding a functional form of the DFRT, one may develop a physical model and examine its behavior over time and/or environmental changes. The different peaks, which can ideally be related to processes, can be analyzed separately. The approach has been demonstrated on several systems, including cathode and anode reactions in solid oxide fuel cells, supercapacitors, degradation processes of PEMFCs, and more.

*Il Direttore del Dipartimento di Ingegneria Industriale
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