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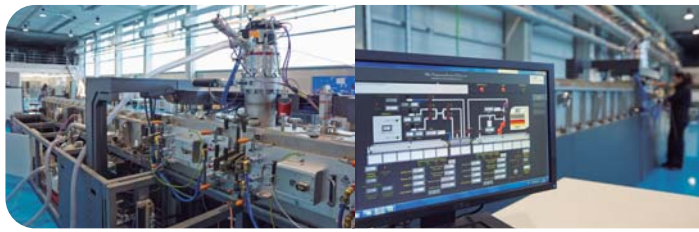
Nanoscale Enhanced Characterisation of SOlar Selective Coatings



Concept

The Concentrated Solar Power (CSP) technology based on parabolic trough solar collector for large electricity generation purposes is currently the most mature of all CSP designs. The current parabolic trough design deals with a maximum operating temperature around 400ºC in the absorber collector tube, but some recent designs are planned to increase the working temperature to 600ºC to increase the performance. These systems are expected to be working during 20-25 years.

However, there is a great lack of knowledge about the performance of the selective absorber coatings of the collectors during the whole life of the receiver.

The main idea behind the NECSO project is to provide tools to the solar plants builders, to guarantee that the selective coating will work properly during 20 to 25 years. Thus, novel experimental methods for testing materials under extreme conditions will be developed in the project and nanoscale characterisation of the nanostructure parameters will be correlated with coating performance. The resulting outcomes are expected to contribute significantly to the infrastructure of the solar energy research, development and industrial activities worldwide.

Objectives

The two main objectives of the NECSO are:

1. To correlate nanoscale structure related requirements (nanoroughness, nanohardness, crystallography, composition, vibrational spectra...) with performance requirements: optical and, more important, life expectancy.

2. To develop characterisation and degradation protocols to serve as a powerful tool for coating developers, producers and end users for life prediction to push the collector parameters (temperatures and environments) to higher efficiency parameters.

In order to achive these main goals the following tasks will be addressed:

- Ageing protocol: to analyze the thermal cycling with different gases.
- Nanoscale structure and requirements: the composition, nanoroughness and crystallography.
- Mechanical properties: Study of the thermal stability, adhesion, nanohardness, and wear.
- Degradation analysis by dry and wet corrosion and the possible synergistic impact of vibration.
- Optical properties and its evolution.
- Limitations to the diffusion after the ageing process.