

Durability issues in photovoltaic modules and solar energy systems

At EUROCORR 2024 in Paris the Task Force on “**Corrosion in Green and Low Carbon Energy Technologies**” will devote a special session to “**Durability issues in photovoltaic modules and solar energy systems**”

One of the more interesting alternative energy sources is solar energy. This occurs naturally and can provide more than enough energy for the whole world’s needs. Its production is limited not only by our capacity to efficiently convert it into electricity or heat, but also by the interaction of materials with the environment, in particular the efficiency loss and material degradation during service. These will impact both the cost of electricity and its reliability.

For photovoltaic (PV) systems, numerous components could be subject to corrosion. Corrosion on frames and busbars can lead to the integrity loss, while degradation of the electronic devices results in the loss of produced electricity. Although PV modules are often considered as the most reliable elements with a warranty period up to 35 years, durability issues such as corrosion of metallic contacts (in particular with the necessity to replace silver) and solders, discoloration of encapsulates, degradation of semiconductors (in particular for new technologies), delamination of the encapsulate, etc., are still important, in particular for the development of new technologies and new applications (flexible PV, AgriPV, Floating PV). The maximum service time is determined by wear out failures often occurring before the end of the anticipated working lifetime, and “in field” verification is too long to validate new materials and technologies. To overcome long-term reliability issues, the development of representative accelerated failure tests and realistic numerical models is needed. These should take into account not only UV irradiation, high voltage, temperature and humidity, but also the chemical composition of the atmosphere, and more generally the chemistry of the “in use” environment, which can result from the climate, atmospheric pollution, leaching from the cell materials themselves, or degradation of the encapsulating material.

For thermal solar technologies, one well-known corrosion topic, corrosion in molten salts, will be covered in a joint session with WP3 “Corrosion by Hot Gases and Combustion Products” and WP4 “Nuclear Corrosion”. High temperature corrosion, however, is not the only issue with thermal solar systems and degradation occurring at lower temperatures, such as atmospheric

corrosion and weathering of solar collectors and reflectors (mirrors), and electronic devices also need attention especially with respect to mitigation technologies to improve their life-time.

The session aims to bring together:

- experts in the areas of corrosion in materials and assemblies typically used for photovoltaic and thermal solar systems, for example assemblies including metals, semiconductors, oxides, polymers and glass;
- experts in corrosion of electronic devices;
- users and researchers working in photovoltaics or thermal solar areas and interested in degradation modes (corrosion of metallic parts such as mirrors, contacts, solders, corrosion of semi-conducting materials, discoloration and delamination of encapsulation, etc.);
- experts developing new analytical approaches or new test procedures.

Papers from both academia and industry are welcome.

We look forward to seeing you in Paris!

Polina Volovitch & Steve Paterson (TF)

Expected duration: **1 day** Expected attendance: **50 to 80 persons**