

## Second Laureate, Fundamental Research

- **Research Work Title:** Unravelling the fundamentals of solar materials
- **Researcher:** Prof. Majed Chergui
- **Country:** Switzerland
- **Field:** Physics
- **Scientific Affiliation:** Professor, Lab director, Director of the Lausanne Centre for Ultrafast Science (LACUS), Ecole Polytechnique Fédérale de Lausanne



### Abstract:

Using cutting-edge novel experimental ultrafast spectroscopic tools pioneered by my group, I have addressed specifically the photophysics of each constituent of sensitized solar cells and photocatalytic devices, with element specificity and with a temporal resolution reaching 10 femtoseconds. The constituents that were investigated consist of molecular sensitizers, for which a full understanding of the photocycle was reached, solid state sensitizers such as perovskites, for which element-specific insight has been provided and finally, the electron-transport material consisting mainly of transition metal oxides (TMOs). The degree of detail reached in the latter case is delivering hitherto unsurpassed insights into the fate of charge carriers therein. The results of our research are already taken to the next step of engineering solar materials for a more optimal energy conversion efficiency.

### Biography:

Prof. Chergui has pioneered ultrafast hard X-ray spectroscopy, in the picosecond (ps) and femtosecond (fs) time domains. He significantly pushed the sensitivity limit of these experiments to allow the study of very dilute systems, such as biological ones. He also known for expanding ultrafast laser spectroscopy into the deep-UV (<300 nm). In particular, he pioneered ultrafast two-dimensional deep-UV spectroscopy. With these novel tools, he undertook a detailed characterization of the fundamental photophysics of all the constituents of solar devices: transition metal complex sensitizers, transition metal oxides and perovskites. His works have led to a new degree of insight and understanding of electronic and photonic phenomena in solar materials. Beyond these achievements, Prof. Chergui is also famous for his studies on Rydberg states in condensed phases and on photoactive and photosensitive biological systems.

