SESAME, A SYNCHROTRON RADIATION FACILITY IN THE CRADLE OF HISTORY

A. LAUSI, M. ATTAL, A.A. ELKADIME
SESAME (Synchrotron-light for Experimental Science and Applications in the Middle East)
Allan, Jordan

The Synchrotron-light for Experimental Science and Applications in the Middle East SESAME is a third-generation 2.5 GeV synchrotron radiation (SR) source in Allan, Jordan. It is the first major international research centre in the Middle East and neighbouring countries. SESAME is a widely available 'user facility'. Scientists, including graduate students, from universities and research institutes, from the region and beyond, typically visit the Centre to carry out experiments for periods that can span from a few days to one or two weeks, frequently in collaboration with scientists from other centres/countries, and then return home to analyze the data they have obtained. In other words, SESAME is not a source of brain drain; quite the contrary, not only do the scientists who visit SESAME take back scientific expertise and knowledge, which they will share with their colleagues and students, but it also creates a motivating scientific environment that encourages the region's best scientists and technologists to stay in the region or to return if they have moved elsewhere.

Synchrotron radiation (SR) beamlines provide one of the most powerful and advanced tools available in modern science for research, covering a wide range of disciplines ranging from materials science and engineering to medicine, cultural heritage, healthcare and the environment, as well as fundamental understanding in physics and chemistry.

The high photon flux, small source size, and low divergence available at SR sources allow for advanced spectroscopy and imaging techniques, well suited for studying ancient and historical materials, which often present very complex and heterogeneous structures. Moreover, SR techniques are non-destructive, and as an SR facility gathers several beamlines around its accelerator, samples can easily be transferred and reanalysed using complementary techniques. At SESAME, a series of accelerators raise the energy of electrons up to the 2.5 GeV used in the storage ring to provide the high brilliance sources for the Infrared Microspectroscopy, the Powder Diffraction and the X-ray Absorption Spectroscopy beamlines, all three already open to users. In 2022 an X-ray Imaging and a Soft X-ray Spectroscopy beamline will come on stream, and Turkey will start constructing a soft X-ray photoelectron spectroscopy beamline, the first to be built by one of the Members. Altogether, the suite of beamlines available at SESAME can address the challenge of supporting research on ancient and historical objects from the region. The geographical position of the facility allows for reducing travel-related risks and establishing research programmes in close cooperation with surrounding institutions devoted to the reseach, preservation, restoration of materials of archaeological, palaeontological, palaeo-environmental and cultural heritage interest. Because of these multiple applications, it will be necessary to establish a working group involving a multi-disciplinary team and develop and share expertise on various factors such as handling, packaging, customs' paperwork, shipping and insurance.