

# The SSHADE project: an European Database Infrastructure in Solid Spectroscopy

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## Abstract

SSHADÉ is an European project of a set of databases to provide to the community with a large number of spectra of solids (ices, minerals, organics, cosmomaterials, ...) of astrophysical and terrestrial interests in the X-ray to sub-mm range. The first of these databases is *GhoSST* (<http://ghosst.osug.fr>). The SSHADÉ consortium has currently 20 partner groups in 18 laboratories from 8 different European countries. This project will be submitted as part of the Europlanet-RI Horizon 2020 program.

## 1. Introduction

Spectroscopy and spectro-imagery are increasingly used in space missions, in orbit or *in situ*, to study the solid phase of the small objects of the solar system (e.g. VIMS/Cassini, DISR/Huygens, VIRTIS/Rosetta, New Horizons, ...): icy, mineral or organic surfaces and grains, dust particles, aerosols, etc. Infrared, Raman, fluorescence and X-rays micro-spectroscopies are used to study meteorites and cometary dusts in the laboratory and onboard some space missions for *in situ* measurements. A major contribution to the analysis of these observations is the measurement in the laboratory of UV, Visible, IR and XANES spectra of a variety of materials (ices, minerals, organics, ...) expected to be present at the surface of small bodies of the solar system or in their ejected grains (e.g. comets, asteroids, TNO, icy satellites, ...).

A large number of laboratories in Europe have developed experiments to measure and study the spectroscopic properties of a variety of solid materials of astrophysical interest, either natural (terrestrial or extra-terrestrial) or synthetic. The amount of data collected is huge and several of these laboratories boast leading-edge expertise in some solid spectroscopy fields. However most of these data, although published, are very difficult to access in a usable form (i.e. electronic) to compare with observation or to use in numerical codes.

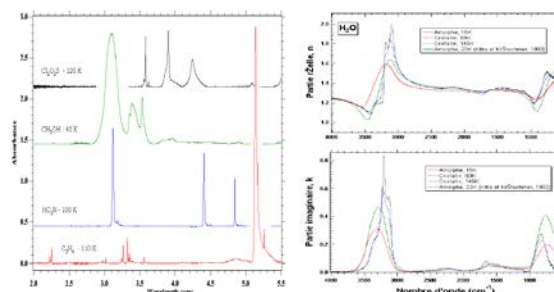


Figure 1: Spectra of organic molecular solids [1] (left), optical constants of H<sub>2</sub>O ices [2] (right)

We thus decided to extend our datamodel (SSDM) and our database (GhoSST) in order to build a database infrastructure able to gather and distribute the spectroscopic data of most of the European laboratories working on solids of any type with astrophysical and terrestrial applications.

## 2. What is SSHADE?

SSHADÉ (“Solid Spectroscopy Hosting Architecture of Databases and Expertise”) is a project of a set of databases on solid spectroscopy.

The SSHADÉ databases will cover laboratory, field, airborne as well as simulated and theoretical spectral data with their corresponding spectra and their various types products (ex: transmission, absorbance, absorption coefficient, optical constants, band list) for many different types of solids: ices, snows and molecular solids, minerals, rocks, inorganic solids, natural and synthetic organic and carbonaceous matters, meteorites and other cosmomaterials, ... with a wide range of measurement technics: transmission, bidirectional reflection, Raman, fluorescence, ... and over a wide range of wavelengths: from X-rays to millimeter wavelengths (can be extended up/down).

It is based on the GhoSST database developments (Europlanet + VAMDC 2009-2012). The SSHADÉ database infrastructure will be hosted at the OSUG

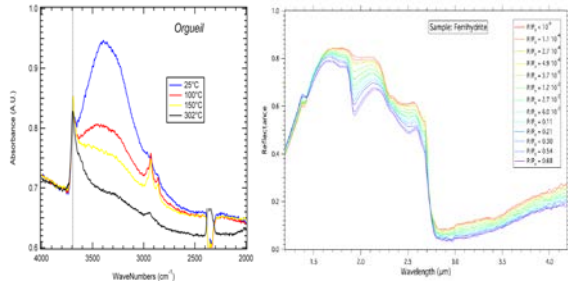


Figure 2: Spectra of meteorites dried under vacuum [3] (left); H<sub>2</sub>O adsorption on mineral [4] (right).

Data Center (University of Grenoble Alpes). The SSHADE project was initially boosted by INSU/CNRS who asked us to develop a “thematic pole on planetary solids” within the new framework of observation services of INSU. The SSHADE development will be part of an European e-infrastructure proposal for Horizon 2020 program (expected start, if selected: end 2015).

The SSHADE consortium has currently 20 partner groups in 18 laboratories from 8 different European countries (F, UK, I, D, E, HU, PL, CH). News about this project can be followed on the SSHADE blog (<http://www.blog.sshade.eu/>).

### 3. SSHADE infrastructure

The SSHADE infrastructure will have:

- A common ‘solid spectroscopy’ interface
- A common Import / Search / Visualization / Export engine
- A common fundamental database (species, publications, objects, band list, ...)
- A set of spectral databases: one per group/laboratory (GhoSST is one of them)

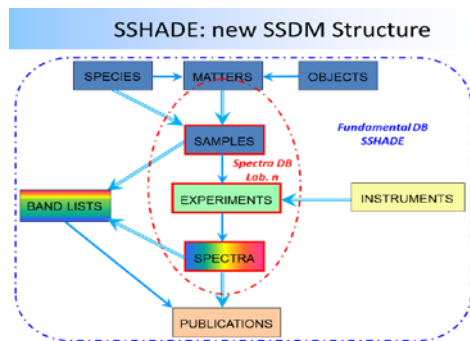


Figure 3: Schematic structure of SSDM for the SSHADE infrastructure

It will be possible either to search all databases at the same time with various filters, or to select the target database(s). Alternatively each database will be also accessible individually at the group web site, as it is currently for GhoSST.

SSHADA will be also a service for Virtual Observatories (Europlanet-VO, VAMDC, ...).

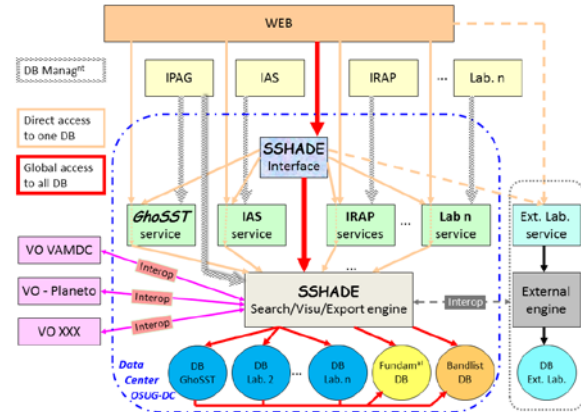


Figure 4: Schematic structure of SSHADA infrastructure

The transformation of the GhoSST database into the SSHADA infrastructure will need a number of modifications such as the separation of the fundamental databases (species, publications, objects, ...) from the individual spectroscopic databases (one per laboratory) and the rewriting of the data queries (mono to multi DB). Each database will be also customized to its content (types of solids, of spectra, ...) for easier search.

### Acknowledgements

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