A laboratory for a multiparametric exploration of meteorites

Federico Di Paolo, Paolo Aloe, Giorgia Montini, Aldo Altamore

Department of Physics “Edoardo Amaldi”, Roma Tre University, Rome, Italy

Abstract

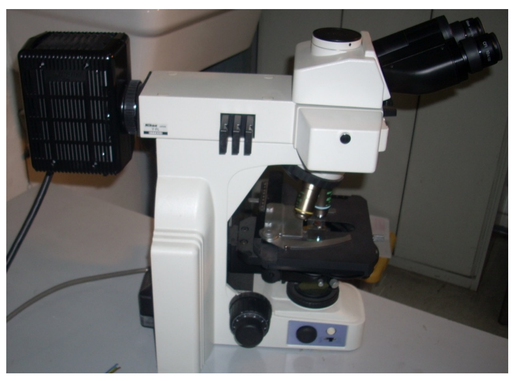
In the framework of the italian national project *Piano Lauree Scientifiche* (PLS) [1], a laboratory dedicated to the study of meteorites was set up at the department of physics of Roma Tre University.

From a collection of meteorite samples we developed portable kits for a use in the schools [2]. Siderite sections are dried by means of an evaporator, to prepare the samples for a protective coating. Thin sections of meteorite samples are also available for polarized light analysis.

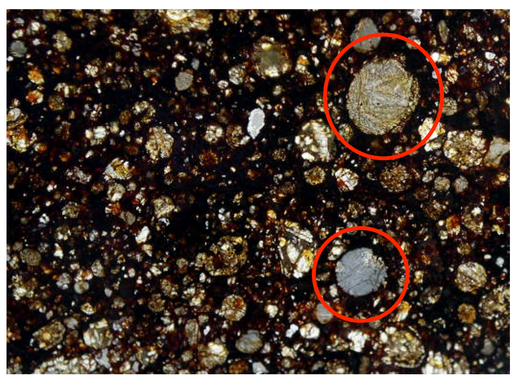
In our laboratory a set of instruments enables a multiparametric study of meteorites for both scientific and educational purposes. A 200-1000x microscope and a stereomicroscope are suited to the visual investigation of geological and structural features of meteorite samples. An UV/Vis/NIR spectrophotometer with integrating sphere enables transmission, absorbance and reflectance analysis; coupled with a cryostat, such instrumentation can reproduce thermodynamic conditions similar to the ones in the space.

With the aim of such equipment intriguing hands-on activities and scientific researches can be performed on meteorite samples by means of non-destructive methods.

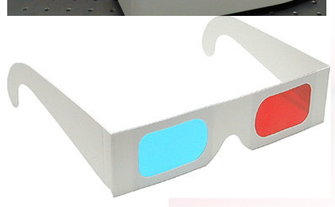
Observing meteorites using a microscope

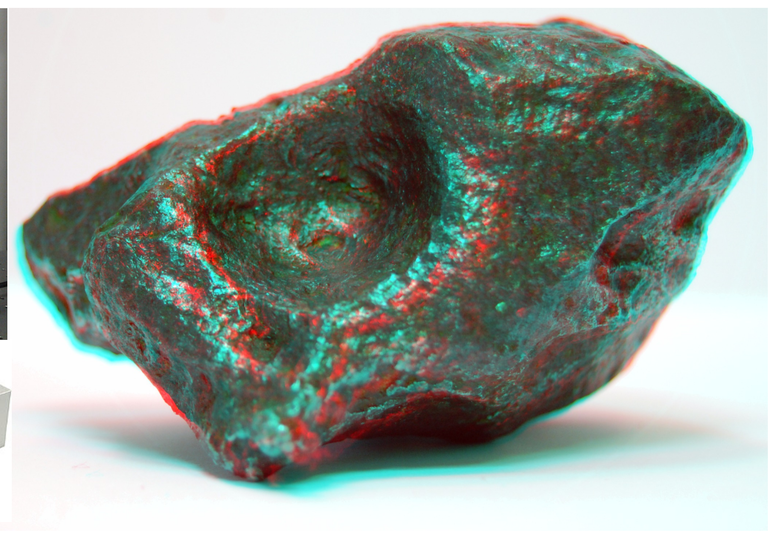


Nikon Eclipse E400 microscope.



A thin section of meteorite observed at microscope. 1 mm long chondrules reveal their structure.



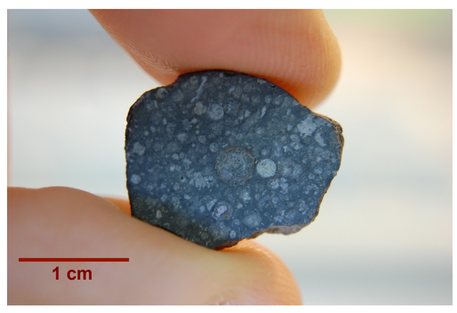


A 10 cm long siderite as can be seen by means of a stereomicroscope: take a look with the 3D glasses!!!

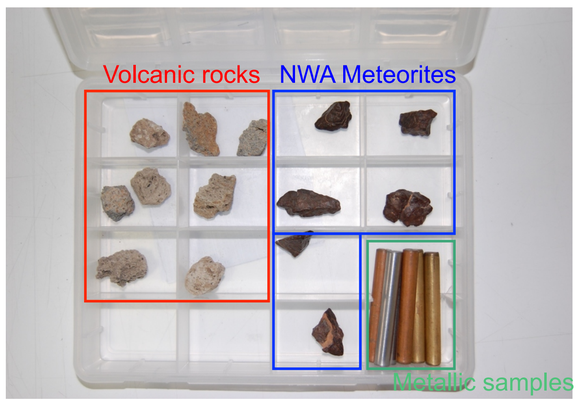
Portable kit of meteorite samples

Itinerant kits of meteorites contain rare samples for classification and identification of chondrules and Widmanstätten patterns.

Sample of the italian Alfianello meteorite.



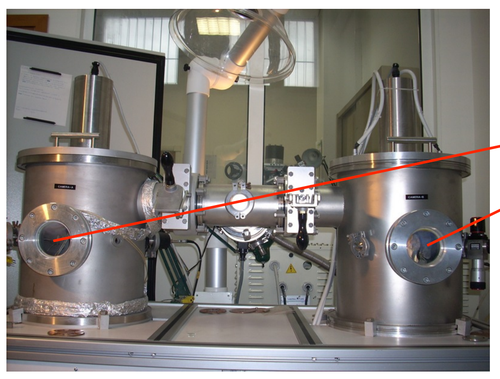
Sample of the Allende meteorite.

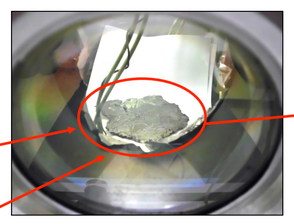


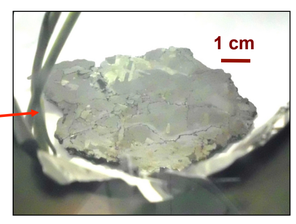
Samples kit for density measurements.

A different kit contains ordinary chondrites for density measurements. Terrestrial materials as metallic samples and volcanic rocks enables a comparison with meteorites.

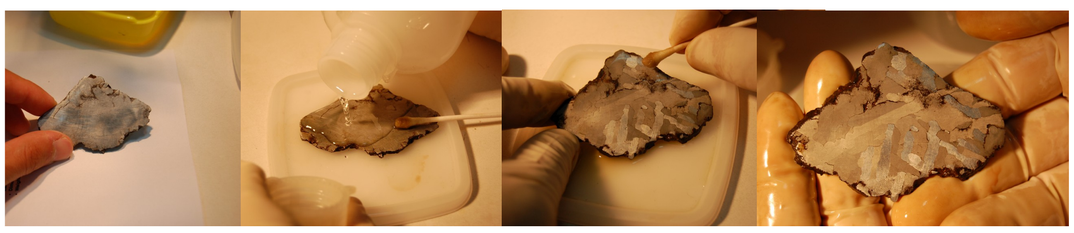
Preparation of samples





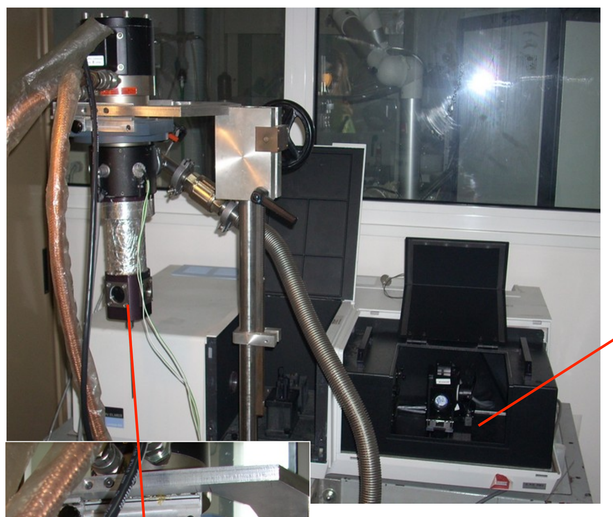


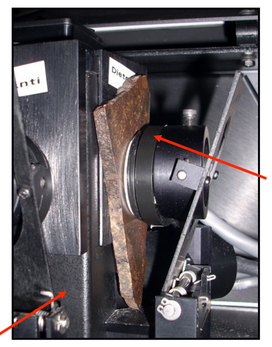
The vacuum chambers are used for meteorite surface degasification. It is also possible to introduce a noble gas to stabilize the rock sample before the protective coating. The vacuum pressure can reach 6 10^{-6} mbar.



Cleaning a 5 mm slice of meteorite Campo del Cielo with Nitol solution to obtain the Widmanstätten pattern.

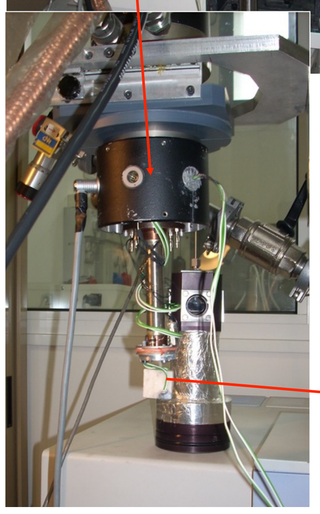
Spectrophotometer with integrating sphere



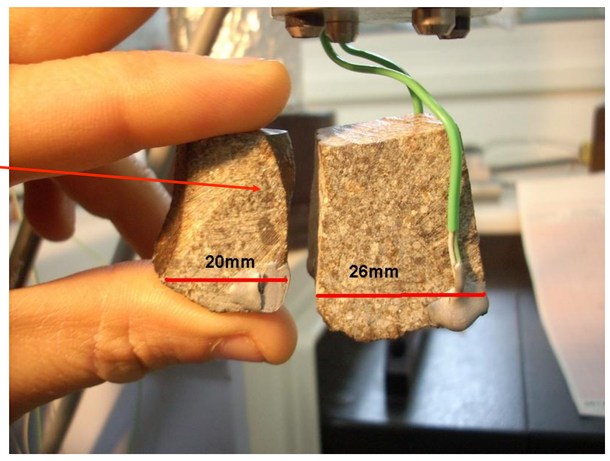


Meteorite sample and integrating sphere.

PerkinElmer Lambda 900 UV/Vis/NIR spectrophotometer with dual beam, dual monochromator optical system, range 185-3300 nm, integrating sphere for total and diffuse reflectance/transmittance effective from 250-2500 nm.



Leybold cryostatic compressor with Helium cilcle at a pressure of 23 atm, temperature range 15-300 K, vacuum pressure in the chamber 4 10^{-3} mbar.



Acknowledgments

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References

[1] http://www.progettolaureescientifiche.eu.

[2] Di Paolo F., Altamore A., Aloe P., Barbarano R., Moretti C., Scollo F., Vecchi M.T., 2011, “Il laboratorio PLS sui meteoriti” , XCVII Congresso Nazionale della Società Italiana di Fisica, oral talk.

Our website: ***webusers.fis.uniroma3.it/cofis/***

Contacts: dipaolo@fis.uniroma3.it
aloe@fis.uniroma3.it