

Location of Appointment: Consejo Superior de Investigaciones Científicas. Dpt Molecular and Infrared Astrophysics. Madrid

Team Leader (contact person): J. Cernicharo

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Category of position: Early Stage Researcher

Duration of Appointment: 36 months (with possibility of an extra year)

Expected starting date: 1st of November 2005

Requirements with respect to candidate: physics, chemistry or astronomy degree

Title of Research Project: Collisional Rates of the SO₂-He system and Astrophysical Applications

An opportunity exists to study for a Ph.D. degree at DAMIR (under the supervision of Prof. J. Cernicharo, DAMIR, Instituto de Estructura de la Materia, CSIC, C/Serrano 121, 28006 Madrid. Spain; e-mail: cerni@damir.iem.csic.es), with secondment at the Observatoire de Paris, section de Meudon, 92195 Meudon Cedex, France (under the supervision of Dr. A. Spielfiedel ; e-mail: annie.spielfiedel@obspm.fr).

General introduction

SO₂ is an abundant species in warm molecular clouds and in the circumstellar envelopes of evolved stars. The HIFI instrument on board of the Herschel satellite will provide the first extensive opportunity to study this basic molecule in the submillimeter and far-infrared domains providing the basic data to derive the physical conditions of the warm gas. SO₂ is the main emitter in Orion, the prototype of a high mass star forming cloud. On the molecular physics side, the determination of the potential energy surface of the SO₂-He system, and the determination of the corresponding collisional rates for the temperatures prevailing in molecular and circumstellar clouds are important topics of the FP6 "Molecular Universe" program. The present proposition aims to gather these molecular data and include them in radiative transfer codes. Comparison with available and forthcoming observations is expected.

The ideal candidate for this position is an enthusiastic researcher with a good background in physics, quantum chemistry and/or astrophysics.

Methods

State of the art methods in quantum chemistry will be used to map the potential energy interactions between the colliding partners. Then the collisional cross sections and rates will be obtained in several steps involving different levels of accuracy.

The collisional rates will be used to interpret the large amount of data existing on the emission of SO₂ and its isotopes in Orion and to predict the submillimeter and far-infrared spectrum of this molecule in different types of molecular and circumstellar clouds. Observations with future instruments, as the Herschel satellite and the ALMA interferometer, will be the natural follow up of this work.

Application

The position is available from November 15th 2005. Letters of application for this position should be sent **by October 15, 2005** to the address above.

The application should include curriculum vitae together with a detailed list of university courses taken and their grades, as well as a brief statement of research experience. The applicant should arrange for two letters of recommendation by persons familiar with his/her undergraduate studies and/or research to be sent to the same address by the deadline. Qualified women candidates are specifically encouraged to apply.

An extra year, for a total duration of 4 years, may be available depending upon funding

All applicants should be aware of the nationality and age constraints associated with this position. The EU conditions for applicability are listed at the Molecular Universe home page.