

IMPLEMENTATION OF FLUORESCENCE SPECTROSCOPY AS BASIC LABORATORY PRACTICE TO INTRODUCE TO THE STUDENTS OF HIGH SCHOOL AND UNDERGRADUATE EDUCATION TO CHEMICAL AND INSTRUMENTAL ANALYSIS TECHNIQUES USED IN PLANETARY SCIENCE. J. C. Fraile¹, Department of Chemistry, Universidad Nacional de Colombia, Carrera 45 No 26-85, Bogotá D.C., Colombia, jcraileb@unal.edu.co.

Introduction: Analytic Chemistry is a measurement science that uses its concepts and techniques to be applied in the different knowledge areas to solve specific troubles about qualitative and quantitative characterization of matter [1], for example the Planetary Science area has a wide application of remote analysis techniques like tools of study to the spacial bodies, including from an asteroid to a galaxy billions of light years, allowing their general characterization with regard to composition, temperature, density, pressure, among others variable that can be defined thanks to these techniques. Although there are many analysis techniques, now we are going to talk about spectroscopy techniques as instrumental techniques which study the interaction of the matter with the electromagnetic radiation. As the boom of the spectroscopic analysis techniques is not just in the Planetary Science but in another action fields, which the needed for general people to understand and to acquire the basic concepts about the daily phenomenon as these, although these techniques seem complex and specialized are commons, they involve frequent terms that we can find everyday in media and scientist disclosure. Therefore it is propose the implementation of a laboratory practice focused to the spectroscopy as a basic topic, which can contribute with the globalization of knowledge planting estates in high school and undergraduated education, to introduce the topic, the fluorescence phenomenon and fluorescence spectroscopy are suggested to facilitate and to attract the interest of the students because of the aspect of the fluorescence offering a nice and awesome experience about science.

Chemical and instrumental analysis techniques:

Actually these techniques are so important in Planetary Science, because exist the needed to obtain data about chemical, isotopic and mineralogical composition of surfaces and atmospheres, moreover it offers a quantification of the distinct bodies, which are being studied. When the spacecrafts and spaceships design are analyzed, we can see the major part of the

equipment and instruments that constitute it, it correspond to basic unit operations and techniques more complex and specialized like gas chromatography and different methods of spectroscopy, Although they differ, allow to acquire essential data to build new hypothesis and models, where the distance is not an obstacle. The demand of knowledge that the population have, is requiring greater academic depth training and basic education to keep the step with science and technology, implementation to the techniques with a higher level of complexity and technical basic lets you generate a very noticeable educational impact and at the same time generate greater public outreach and information science.

Spectroscopy: It is a chemical analysis technique which because of to its versatility and wide range of information that can be about a body in study, it has became in absolutely essential technique today for Planetary Science in all the studies which have been doing now like all the studies will undertake in the future. Because of its importance in different action fields, it is also result essential to the general community to acquire a basic knowledge about this technique. So with the idea to propose to implement the spectroscopy as a basic laboratory technique and the need to lead a dynamic teaching, the basic laboratory practice about fluorescence spectroscopy is postulated.

Fluorescence spectroscopy: The fluorescence as an emission process is a phenomenon so striking for the aspect that the samples acquire when they are exposed to radiation, like the emission of light is of different ways and with different wavelength according to the chemical composition of the sample, we can observe the distinct characteristics colors with the light radiated.[2] When we talk about education, is important to find dynamic and attractive teaching methods to motivate the students, therefore the idea to propound a laboratory technique more complex than basic laboratory techniques have to include any tactic to captivate the interest of the students to understand the visual phenomenon and the impact it has in the individual after the experience.

Laboratory guide: the guide will allow students of high school and undergraduated to acquire the necessary concepts to develop the laboratory practice based on fluorescence phenomenon and fluorescence spectroscopy as a general perspective of spectroscopy techniques that are used nowadays and are very important. The guide is a source to help both, students and teachers, before, during and after the practice is done. Firstly the lab guide will have a theoretical frame that will allow students to know the basic concepts about the technique, then, it will indicate the materials, equipments, requirements, cautions, procedures and, at the end, it will offer a questionnaire to evaluate students knowledge and will provide a guide to do analysis of fluorescence phenomenon and fluorescence spectroscopy means of calculations and observations made by each one of the students during the session. Four minerals are suggested with different emissions of fluorescence like the samples to be used in practice, it provides at the same time, a vision about the use of this technique on the branch of Geochemistry and Planetary Science.

Educational impact and public outreach: implementation of a laboratory practice addressing the fluorescence topic and fluorescence spectroscopy have like objective to introduce and to offer to the students of high school an undergraduated education to a so frequent and used technique today in the different areas as Planetary Science, where this and another methods of spectroscopy are used to a remote analysis of spatial bodies to identify and quantify chemical and mineralogical species, besides to determine structures of the samples or bodies studied. The main idea consists in the practice to provide a general perspective of the topic and its characteristics, allowing to meet the application in Planetary Science and generating the decentralization of scientist knowledge to achieve the scientist disclosure has a major outreach inside the society without any limitation.

Conclusions: To propose a laboratory practice about fluorescence phenomenon and fluorescence spectroscopy in the area to the Basic Chemistry in high school and undergraduate education are based on to offer to the students a general perspective about the different spectroscopy techniques which are used often in Planetary Science to identify chemical, isotopic and mineralogical composition, besides of to quantify it. So it allows to decentralize the knowledge and to increase the public outreach of the scientist disclosure. At the

university the group of Planetary Science TITAN is working so hard to implement the spectroscopy technique as a basic laboratory practice to undergraduate students because we know the importance that the chemical and instrumental analysis techniques have into the Planetary Science and Geoscience, and also we are working in the scientist disclosure with some projects focused to the acknowledgment of the Planetary Science in our country Colombia.

References:

- [1] Skoog D., West D., Holler F., Crouch S. (2005) *Fundamentos de Química Analítica 8 ed*, 27, 717.
- [2] Skoog D., West D., Holler F., Crouch S. (2005) *Fundamentos de Química Analítica 8 ed*, 27, 837- 843.