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Radiation Activities at ENEA Calliope Gamma Facility

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Since the eighties, the Calliope gamma irradiation facility (Casaccia R.C., Rome, Italy) was deeply involved in many research activities, in the framework of international projects and collaborations with industries and research institutions, focused on the investigation of gamma irradiation effects on chemical and physical properties of different materials.

The Calliope Facility, located in the ENEA-Casaccia Research Centre, is a pool-type irradiation facility equipped with a ^{60}Co γ cylindrical source array (mean energy of 1.25MeV) in a high volume ($7.0 \times 6.0 \times 3.9$ m³) shielded cell. The plant is equipped with dosimetric services and a monitoring system for logging the irradiation time, that allow to calculate the absorbed dose in materials due to the irradiation. Available dosimetric systems include Fricke, Red-Perspex, alanine-ESR and TLD. Different irradiation dose rates, from zero to a maximum of some kGy around the rack longitudinal axis, are available by placing the sample in specific position within the irradiation cell. The irradiation tests could be carried out in air, under vacuum or under inert atmosphere. Several researches and qualification activities, in compliance with the international standard specifications, were carried out at the Calliope facility. Irradiation and dosimetric certifications are issued by the Calliope facility after each irradiation test. Qualification tests are mainly performed on electronic components and devices for application in hostile environment such as nuclear plant and aerospace and on concrete matrices for nuclear waste disposal and storage. The Calliope facility is indicated by the Italian Space Agency ASI as ASI Supported Irradiation Facility (ASIF), recommended by the European Space Agency ESA.

Synthetic and natural polymeric materials used in many fields (e.g. nuclear and space application, medical devices, food packaging, cultural heritage) are studied in term of gamma irradiation induced processes (cross-linking and degradation). Their behavior is evaluated in different atmospheric conditions (air, vacuum or inert gases), paying particular attention on the irreversible modification occurring during or after the end of gamma irradiation.

At the Calliope laboratory, biological researches for the conservation and preservation of cultural heritage archived materials (books, images) are related to the bio-deteriogen eradication assisted by gamma radiation and to the assessment of the recovery procedures. Other biological studies are related to the agriculture and the environmental, such as biological control of pests assisted by gamma irradiation (SIT, Sterile Insect Technique) and agricultural product treatments.

Activities concerning polymers and biological applications on cultural heritage are carried out in the framework of IAEA Coordinated Research Project F23032 (Research Agreement No.18922/RO, 2015-2019).

The Calliope facility laboratory is equipped with several instruments for the evaluation of scintillating material performances by optical (UV-VIS and FTIR spectrophotometer, luminescence measurements), spectroscopic (ESR spectrometer) and Light Yield measurements in term of number of photoelectrons emitted per unit of the absorbed energy (MeV).

Great expertise has been achieved on radiation detectors, optical components and scintillators (optical fibers, crystals and glasses) applied in High Energy Physics experiments, such as CMS ECAL experiment at LHC CERN and Belle II experiment at SuperKEKB (Japan).

Country/Organization invited to participate

Italy

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