Asian J Biomed Pharmaceut Sci, Volume:9
DOI: 10.4066/2249-622X-C2-021

9th World Congress on
Chemistry and Medicinal Chemistry
May 13-14, 2019 | Prague, Czech Republic

# Material science for medical radionuclides production: Cyclotron solid target preparation in the framework of LARAMED project

**Hanna Skliarova, S Cisternino, G Cicoria, M Marengo, G Gorgoni, E Cazzola, J Esposito, C Rossi Alvarez** and **V Palmieri**
National Institute of Nuclear Physics, Italy

Nuclear medicine is a field of medicine that uses a trace amount of radiopharmaceuticals for the diagnosis and treatment of many health conditions such as certain types of cancer, neurological and heart diseases. Radiopharmaceuticals are pharmaceutical drugs containing radioisotopes.

Nowadays two main approaches to produce radioisotopes for medical interest are used: as decay products in so-called "generators" and a direct production by cyclotron irradiation of a dedicated target.

At INFN-LNL a new high performance 70 MeV cyclotron has been installed. It will be dedicated not only to nuclear physics study, but also part-time to medical physics application. LARAMED (Laboratory of Radioisotopes for Medicine) project is aimed to R&D on medical radionuclides cyclotron production. Waiting for the facility full operation, LARAMED team has started working on the cyclotron production of conventional (Tc-99m) and emerging (Cu-67, Sc-47, Mn-52) radionuclides in a collaboration with other institutions.

Suitable target design and preparation is one of the most critical technological challenges in cyclotron production of radioisotopes. To maximize the nuclear reaction yield, the production should be performed at maximum proton currents. Thus, the target system should provide high efficiency of heat dissipation. The basic solid target system supposed to be the target material deposited on a baking plate, liquid/gas cooled. In order to maximize the heat dissipation, the target should be constructed of materials with maximum thermal conductivity, including both target material itself and target backing plate, by a method providing good thermo-mechanical contact between them. The chemical inertness of the backing plate in the target dissolution conditions should be also considered.

For different radionuclides production LARAMED group has studied a set of non-classical techniques for metallic target preparation, like magnetron sputtering, High energy Vibration Powders Plating (HIVIPP) and Spark Plasma Sintering (SPS). Current presentation will include results on the use of described methods.

**e**: Hanna.Skliarova@lnl.infn.it

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