**Design and characterization of environmental radioactive samples**

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The project RemoteAlpha develops a remote detection method for alpha-emitting radionuclides. Due to the short range of alpha particles in the air of only a few centimeters, this cannot be achieved by radiometric methods. Instead, UV photons are detected originating from nitrogen molecules that have been excited by fast alpha particles traveling through air. These photons have a far longer range than the alpha particles themselves and can be measured with an optical system from a large distance. The system should be used in emergency cases where large areas are contaminated. Before the first experiments in the environment can be done, common environmental surfaces are contaminated under well-known conditions in the lab, characterized and measured.

Pitchblende was the first environmental material that was prepared for measurements by LUH. Pitchblende is a naturally occurring mineral, which contains uranium and its radioactive daughters, most of them alpha-emitters. Stones with an estimated high amount of uranium were selected and cut into slices. These slices were characterized with the grid ionization chamber (GIC) for the energy distribution of the various alpha emitters. The amount of UV-photons is correlated to the energy of the trigger alpha particle. From the spectrum of the GIC, a possible amount of detectable photons can be calculated. Only, when this amount exceeds the detection limit of the optical system, the source can be clearly identified.

Since pitchblende is an environmental sample, the alpha emitters are not necessarily distributed homogeneously over the surface. For estimation of the extent of this inhomogeneity, alpha-track-detection was used. In this detection method, the alpha particles generate holes in a plastic foil, which can be observed and analyzed by a microscope after chemical etching.

Ten samples, which have the largest amount of alpha emitters and which are distributed quite homogeneously over the entire sample area were chosen for measurements with the optical system at PTB. They emit roundabout 50 to 250 alpha particles per second and square centimeter. The first sample was successfully measured in the UVA and UVC range. For the UVA measurement, air as a reaction medium was sufficient although, as expected, the measurement in pure nitrogen was much better. To measure the sample with the UVC-detector, a mixture of nitrogen with nitrogen oxide was needed. These very first experiments show that the system in principle works fine with environmental samples of low alpha activity. Further experiments will follow soon.

While the pitchblende samples are going to be measured at PTB, the next environmental surface is being prepared. It´s concrete, a material widely used in road or house construction. The first possible samples were manufactured and their surface is currently under examination. Afterward, samples of different surface roughness will be contaminated with Am-241 to investigate the influence of roughness and other parameters on recovery rate. Subsequently, these samples will be ready for measurements with the optical system.