Poster Presentation

LA.P35

Gemstones and Salts as Light Emitters for Learning X-ray Detectors

E. Arakawa[1], W. Voegeli[1], C. Kamezawa[1, 2], R. Iwami[1], T. Shirasawa[3, 4], Y. Yamaguchi[3], M. Kamogawa[1], M. Nakata[5], K. Hyodo[2]

[1]Dept. of Physics, Tokyo Gakugei University, Japan, [2]Photon Factory, IMSS, KEK, Japan, [3]ISSP, The University of Tokyo, Japan, [4]JST, PRESTO, Japan, [5]Dept. of Astronomy and Earth Sciences, Tokyo Gakugei University, Japan

The scintillation counter is a widely-used X-ray detector. It contains a scintillator as a luminescent material that converts X-rays into visible light, which is detected with a sensor. A well-known scintillator in the X-ray region is sodium iodide, NaI, an ionic crystal. Before use, it is important to understand how the detector works. For students, the material name and the chemical formula of the scintillator are not familiar, however. In addition, students cannot watch or touch the key element in the detector, because the scintillator is installed inside the housing. Many jewels emit visible light or change their colors under ultraviolet light irradiation. Under X-ray irradiation, the same jewels exhibit similar responses as well. If popular jewels instead of special ionic crystals were used as scintillators, students might show interest in these materials. We propose that photographs of beautiful, brightly shining gemstones and salts could be used as visual educational materials for students to learn the principles of X-ray detectors. Different gemstones and salts were irradiated by intense white synchrotron X-ray radiation at beamline NE7A1 of the PF-AR synchrotron radiation facility at KEK, Japan. Photographs of fluorescence and phosphorescence from the gemstones, and of color changes due to the irradiation, were taken with a remote controlled digital camera. It should be noted that the experimental setup of this study is an easily understood handmade X-ray detector. We will present photographs of exciting gemstones such as Fluorite from the US, Hackmanite from Afghanistan, Mangano Calcite from China, Ruby from Brazil, Selenite from Canada, and Black Opal from Australia. We also irradiated different kinds of colored Himalayan Rock Salt from India or Pakistan, shown in Fig. 1. We will explain basic concepts of X-ray detectors, such as photon counting, dead time, recording, and quantum efficiency, with these photographs.

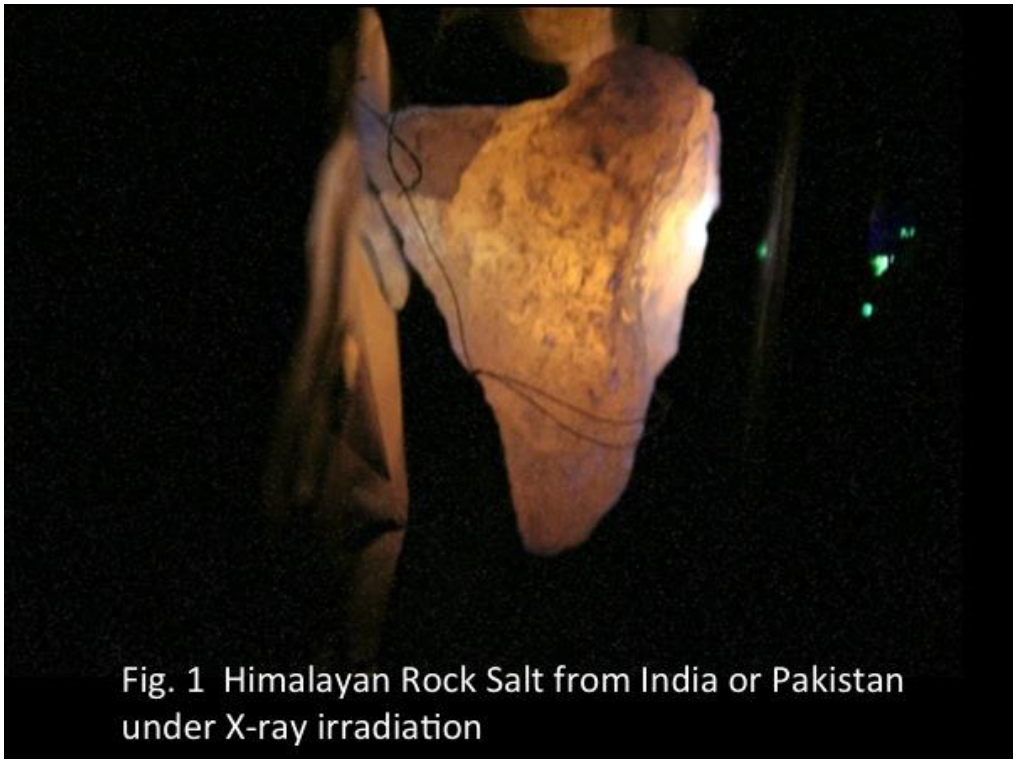

Fig. 1 Himalayan Rock Salt from India or Pakistan under X-ray irradiation

Keywords: scintillator