**Introduction:** Relative to the Sun’s photosphere, alkaline elements are more or less depleted in the inner solar system bodies (Earth, Moon, Mars and Vesta) and all meteorites except CI-chondrites [1]. This depletion implies that volatility-controlled elemental fractionations could have occurred in the early solar nebula (e.g. [2]). In relatively few cases, very alkali-rich materials have been observed in chondritic breccias: K-Rb-Cs-rich igneous rock fragments in Bhola (LL3–6), Krähenberg (LL5), Y-74442 (LL4), Siena (LL5) and Acfer 111 (H3–6) [3–7], and halite and sylvite in the Zag (H3–6) and Monahans (1998) (H5) chondrites [8,9] as well as in returned samples from 25143 Itokawa [10,11]. Cosmochemical studies on these alkali-rich materials provide good opportunities to understand fractionation processes of moderately volatile elements that occurred on their parent bodies or at an early stage of the solar system evolution [3,5,7,8,12]. Moreover, the alkali-rich materials might have caused a large alkali/alkaline earth fractionation, which, in turn, could be possible more precise dating utilizing the parent-daughter pairs of long-lived radionuclides [15] with resultant improved sampling of the resulting image.

After the radiography experiments the rock samples were taken out from the bags and were decomposed in a mixture of HF and HClO4, and then combined with mixed 87Rb-86Sr and 40K-48Ca spikes. Calcium, Sr and (K + Rb) were separated using a cation exchange column. The K, Ca, Rb and Sr abundances were determined by isotope-dilution thermal ionization mass spectrometry (ID-TIMS) [7,13].

**Results and Discussion:** We used acrylic IP holders and polyethylene sample bags. As a result, background noises during exposure were reduced down to 0.4 volume/pixel/day. In addition to radiations from radionuclides contained in the samples, natural background radiations (cosmic-rays and natural γ-rays) also contribute to further ionization of some Eu3+ to Eu4+ in the phosphor screen. Thus, for samples with K in the low µg range, which will require several weeks to generate an image, it is necessary to store the IP in a shielded area.

Figure 1 shows correlations between K (in µg) and PSL-value (IP volume, a.u.) for different exposure times. Fading of the stored images on the IP could have occurred after several weeks’ exposure [16]. Exposure time depends on the concentration of the radioactive emitters in the sample. Total incident is expected to be ~30 decay events of 40K per day for the sample containing 10 µg K. In order for samples containing several µg K to be visible, a longer exposure...
time is necessary. Finally, we have undertaken radiography experiments for fifty days under a nitrogen purge to reduce particles from decay of radium at the Low-level Radioisotope Measurement Facility, Institute for Cosmic Ray Research, Univ. of Tokyo, which is located in a basement 23 m from the surface. Among twenty-seven rock-fragments weighing 0.23 to 17.3 mg, we have regarded at least eighteen as K-rich (Fig. 2).

The autoradiography method cannot discriminate between different types of radioactivity (α-, β- and γ-radiations). A certain level of radioactivities could have come from radionuclides other than 40K, such as 87Rb and decay series of 235,238U and 232Th. Alkali-rich rock fragments in LL-chondritic breccias, Rb and U contents are 100 ppm and 0.02 ppm, respectively [5,7]. Thus, total amounts of Rb, U and possibly Th in the samples become 1 µg, 0.2 ng and 1 ng at most, respectively, suggesting that the samples do not contain sufficient amounts of radionuclides, except 40K, that produce PSL on IP. Polyethylene films reduce α-particles from the samples. Moreover, γ-rays only weakly interact with the radiosensitive screen. These facts suggest that the obtained PSL are mainly come from decay of 40K. We further take into account self-shielding within the sample material.

Conclusions: The autoradiography using IPs are useful to identify not only K-rich rock fragments in chondritic breccias but also K-rich chondrules as well as sylvite in chondrites without serious contamination if appropriate sample preparation and shielding from natural radiations are conducted. Detection limits to identify K-rich materials are considered to be ca. 10 µg of K in mm-sized samples.