Dosimetry Application of the $YAlO_3$:Mn Based Materials

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Application potential of Mn^{2+}-doped $YAlO_3$ (YAP) for thermoluminescent (TL) dosimetry of ionizing radiation has been shown previously [1-2]. For this purpose, one of two types of detectors can be used. The first type detectors have green emission near 530 nm in the main TL peak at 200°C [1], whereas the second type detectors have orange emission around 640 nm in the TL peak near 350°C [2]. The first type detectors have strong daylight effect on fading and optical stimulation by blue light can be used for their readout. On the other hand, the second type detectors with TL peak near 350°C have no daylight effect on fading.

High chemical and time stability, radiation damage resistance and high sensitivity to ionizing radiation (up to 40 relative to TLD-100), extremely wide range of linearity (from few μGy up to few kGy) and the optical emission in visible are the most attractive properties of the material. The material is a good candidate for low, middle- and partially high-dose dosimetry of ionizing radiation, when tissue equivalence is not required. The material possesses relatively high efficient atomic number (Z_{eff} = 31.2), therefore the radiation energy response should be taken into account especially for the radiation energies below 0.5 MeV.

The present work demonstrates main features and dosimetric properties of the $YAlO_3$:Mn based detectors in the form of single crystalline and ceramic materials, including the calculated and experimental energy response of the material in the range from 0.005 to 10 MeV.

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