Light Science & Applications

Temperature sensing based on afterglow intensity ratio scheme

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Temperature sensing based on afterglow intensity ratio (AIR) in persistent phosphor does not need real-time photo-excitation and is hardly disturbed by stray light and extra heat induced by temperature measurement. Several studies of AIR thermometry have been carried out where Boltzmann equilibrium mechanism is mainly applied for manipulating the AIR. Here, we report AIR thermometry based on thermal activation mechanism that works in the population distribution from the $4f^15d^1$ state to the $^3P_0$ state of Pr^{3+} and in the de-trapping process of the filled traps which show different AIRs for different depths. A maximum relative sensitivity of 4.12 $\%K^{-1}$ for temperature sensing in range of 303-443K and that of 3.61%$\%K^{-1}$ in range of 553-803K, wider than other afterglow thermometers, are achieved.

Short Bio:

Jiahua Zhang received his PhD degree in Condensed Matter Physics from Changchun Institute of Physics, CAS, China. He is a professor of Changchun Institute of Optics, Fine Mechanics and Physics, CAS, China.