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White and Red Light Photoluminescence of ZnS:Eu^{3+} - CMC Nanophosphors AHEMEN IKORKYA, Department of Physics, University of Agriculture Makurdi, Nigeria, DILIP DE, Department of Physics, Covenant University, Ota, Ogun State, Nigeria, OSITA MELUDU, Department of Physics, Modibo Adamawa University of Technology, Yola, Adamawa, Nigeria, V. BRUNO, Laboratoire de Chimie de la Matière Condensee de Paris — White and red photoluminescence based on europium-doped zinc sulfide nanocrystals capped with sodium carboxymethyl cellulose (ZnS: Eu^{3+} - CMC) was synthesized using precipitation technique with Eu^{3+} ions doping concentrations of 1 mol% and 5 mol%. Some portions of the doped samples were annealed at 300 °C in a sulfur-rich atmosphere. All samples show cubic (zinc blende) structure with crystal sizes; 2.56 nm and 2.91 nm, for the as-synthesized samples, 4.35 nm and 3.65 nm for thermally treated samples, respectively. The as-synthesized samples have equal energy band gap of 4.2 eV, but decreased to 3.76 eV and 3.81 eV after heat treatment. Photoluminescence studies indicate defect emission bands and Eu^{3+} ion lines for the as-synthesized samples. The as-synthesized samples gave pure orange-red emission when excited at wavelength of 394 nm and 465 nm. After thermal annealing of the samples, a broad emission band in the blue-green region assigned to defect related states emerged or were enhanced. Also enhanced were the emission lines of Eu^{3+} ions in the orange-red region. A combination of these two transitions gave white light of different shades depending on Eu concentration or excitation wavelength. Different shades of white light from cool white through Day-light to warm white light were recorded on the CIE 1931 chromaticity diagram. The source excitation wavelengths range from UV-330 nm through near UV – 396 nm to blue - 465 nm wavelengths which are in the range of InGaN –based LEDs emissions.

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