Development of a semiconductor for highly-efficient emission of ultraviolet light

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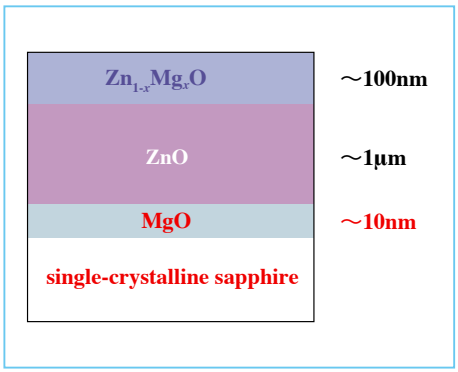
High-quality $Zn_{1-x}Mg_xO$ alloys are found to be very efficient UV light emitters, even more efficient than ZnO, particularly in the high-temperature region. The emission band width and strength of the photoluminescence from $Zn_{1-x}Mg_xO$ alloys increase remarkably with increasing Mg concentration. We have revealed that the increase in the strength is mainly due to the increase in the activation energy required for the nonradiative recombination process. Therefore, it is suggested that the localization of excitons due to spacial fluctuation of the Mg concentration in $Zn_{1-x}Mg_xO$ alloys takes place, and that the degree of the localization increases as Mg concentration increases.



Schematic illustration of the cross section of the samples

A resource-saving method of manufacturing CIGS thin films for solar cell

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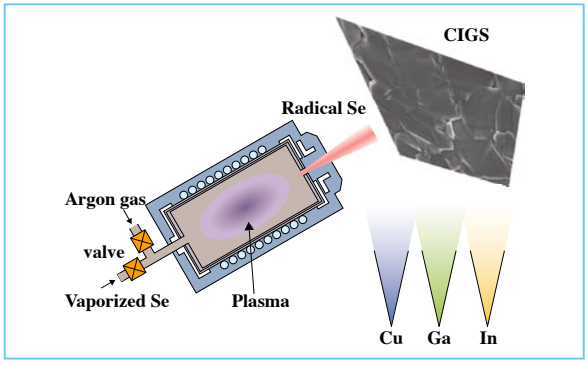
We have developed a novel technique to grow device-grade $Cu(In,Ga)Se_2$ (CIGS) thin films using a radio frequency cracked Se-radical beam source. A Se-radical source meets the technical challenges of high-quality CIGS film growth, efficient use of Se source, and precise control of growth conditions and film properties. Using a CIGS absorber grown with a Se-radical source, an energy conversion efficiency of 17.5 %, which is comparable to conventional CIGS solar cell performance, has been achieved. Se source material consumption by the Se-radical source is significantly reduced to be less than 1/10 compared with a conventional Se-evaporative source. This result will lead to reduced production costs of CIGS solar cell modules and sharply reduced levels of industrial waste generation.



Manufacturing of CIGS thin films using a Se-radical source