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Fully-Inorganic and Lead-Free Perovskite films

Fully-inorganic perovskites, today, are an important part of a fervent research spread all over the world, on materials to be employed as active layers for new generation solar cells, and, in more general frame, optical devices.

After a general remarks on perovskite materials as visible-light sensitizer for photovoltaic cells and how they work, in particularly, we report recent results on fully-inorganic with lead, $CsPbBr_3$, and lead-free, $Cs_2AgBiBr_6$, perovskite films synthesised on Si(111) and indium tin oxide. They were grown by means of MBE and liquid-processing, using a precursor salt $CsPbBr_3$ and a combination of CsBr, AgBr and $BiBr_3$ salts. The physical-chemical properties of the perovskite films, have been carried out, by x-ray diffraction (XRD), photoluminescence (PL), optical absorbance, scanning electron microscopy (SEM), scanning transmission electron microscopy (STEM), core-level x-ray photoelectron spectroscopy (XPS), reflection high-energy electron diffraction/Auger electron spectroscopy, and finally ultraviolet valence band spectroscopy.

The MBE of $CsPbBr_3$ perovskite films, grown on reconstructed Si(111)7×7, exhibited the orthorhombic phase, as revealed by impressive XRD and STEM measurements.

For $Cs_2AgBiBr_6$ XRD displayed that the perovskite films were polycrystalline, with the intense diffraction peaks, attributed to the cubic phase, symmetry group $Fm\bar{3}m$; a gap of about 1.92 eV was deduced from the optical properties and PL measurements, as well as fascinating nanocrystals, having different sizes, were observed by SEM. Very interestingly, the XPS measurements showed, among others, strong Cs3*d*, Ag3*d*, and Bi4*d* core levels with a low content of O1*s* and C1*s* peaks, after several days of air exposure.

Uprzejmie zapraszam wszystkich pracowników, doktorantów i studentów Instytutu Fizyki.

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