

# [What perovskite was found to be able](https://assignbuster.com/what-perovskite-was-found-to-be-able/)

What kind of Chemist am I? Perovskite is a calciumtitanium oxide (CaTiO3) mineral and the compounds which have thesame type of crystal structure as CaTiO3 (A2+B4+O2-3), known as perovskite. Perovskite was found to be able to absorb sunlightand generate electricity which made the researchers effectively use perovskitein solar cells, for color displays and for catalytic converters. Ceriumincorporated perovskite:-1Yue’sgroup studied the effects of cerium incorporation on the catalytic oxidation ofbenzene over ? ame made perovskite La1? xCexMnO3catalysts.

It was found out that the incorporation of cerium improves thebenzene oxidation activity and the perovskite in which x was 0. 1 exhibitedhighest activity. Incorporating cerium and manganese was essential as the oxygenstorage capacity (OSC) is a characteristic property of Ce3+/Ce4+ions and the synergistic effect between Ce3+/Ce4+ and Mn3+/Mn4+hasbeen known to enhance catalytic activity. The incorporation of cerium had anegligible effect on the speci? c surface area of the perovskite and hence thisfactor has little impact on the catalytic activity of perovskite.

Thesubstitution of La3+ by Ce4+ resulted in an increase inthe surface Mn4+/Mn3+ ratio and a decrease in the surfaceOads/Olatt ratio due to charge neutralization. Thesetrends in the Mn4+/Mn3+ and Oads/Olattratios exhibit good correlation with the catalytic activity during benzeneoxidation, indicating that the Ce4+ induced modi? cation of the Mn4+/Mn3+ratio and the oxygen species was accompanied by enhanced catalytic activity. Yang’s groupinvestigated photocatalytic decomposition of water to produce hydrogen under UVradiation over layered perovskite KBi3PbTi5O16photocatalyst synthesized by polymerized complex (PC) method. The perovskiteKBi3PbTi5O16 was synthesized by the PCmethod at a lower calcination temperature (1073K, 2hrs) rather than theconventional solid state (SS) reaction method which include higher calcinationtemperature for a longer time (1273K, 6hrs). The photocatalyst was characterized byX-ray diffraction, ultraviolet-visible spectra, Brunauer-Emmett-Teller specificsurface area, and FT-IR.

The perovskite KBi3PbTi5O16synthesized by PC method showed unique photocatalytic properties in the aqueoussolution containing cerium species. The drawbacks of the sample prepared by theSS method which were a severe loss of alkaline-metal components and large graingrowth (surface area shrinkage by heat treatment at high temperature), whichmay lead to low photcatalytic activities can be overcome by the preparation ofperovskite using the PC method. Itwas found that the rate of hydrogen evolution was greatly improved and affectedover the perovskite by the addition of Ce(SO4)2 in anaqueous suspension, which showed a volcano plot as a function of theconcentration of Ce(SO4)2 passing through the maximumhydrogen evolution at Ce(SO4)2= 2. 4mM. This suggestedthat perovskite essential promoters for hydrogen production in the cerium-containingaqueous solution were the cerium(IV) cations adsorbed on the perovskite surfaceas well as Ceaq3+ in the aqueous phase, which weretransformed from the Ceaq4+ species in the aqueoussolution of cerium(IV) sulfate during the induction period. Those cerium cationpromoters seem to be effectively recombining with the inhibitors of thephotoexcited electron and hole resulting in more efficient way of hydrogenevolution by photocatalytic decomposition of water. Song’s groupsynthesized cerium and ytterbium codoped halide perovskite CsPbCl1.

5Br1. 5quantum dots (QDs) to try to improve the photoelectric conversion efficiency(PCE) of silicon solar cells (SSCs). They tried to overcome the limitation ofPCE for SSCs which can be attributed to the low spectral response atultraviolet (UV) and blue wavelengths (300–450 nm). So the incident photons ofhigher energy within UV-blue wavelengths are absorbed within a short distancefrom the surface, which results in high recombination loss. Considering thedownconversion or quantum cutting of rare earth (RE) ions approach, they triedto improve the PCE whereby virtue of energy transfer processes between different RE centers, such as Ce3+and Yb3+, quantum cutting can realize the emission of two ormultiple near-infrared photons for each ultraviolet/visible photon absorbed andhas potential to largely improve the PCE of SSCs as well as the other types ofsolar cells. So it is expected that the introduction of some rare earth (RE)ions with near-infrared emissions into lattices of the halide perovskite canexhibit the excellent optical properties of both RE ions (long lifetime andlarge Strokes shift) and the perovskite QDs (large absorption crosssection, weak electron–phonon coupling and high luminescence quantum yield) expand theiroptical properties. They synthesized various Yb3+doped, Yb3+, Er3+, and Yb3+, Ce3+ codoped CsPbClxBr3? xQDs, and their films was successfully self assembled by liquid-phase depositingmethod in front of SSCs resulting in an extraordinary enhancement of PCE from18.

1 % to 21. 5 %. The larger absorption cross-section, weaker electron–phononcoupling and higher inner luminescent quantum yield contributed to successfullyexplore the doped perovskite nanocrystals as a downconverter of commercial SSCs. 4Christouand coworkers synthesize 3-D perovskite Ce3Mn8O8(O2CPh)18(HO2CPh)2(CeIII2CeIVMnIII8) athigh temperature in the solid state. The structure was determined bysingle-crystal X-ray diffractometry and consists of a {CeIVMnIII8(? 3-O)8}12+unit comprising a Mn8 distorted cube with a CeIV at itscenter held together by four ? 3-O2? and four ? 4-O2? ions, with the latter connecting to two external CeIII ions attachedon opposite faces of the cube. The organic ligation consists of two ? 4-, four ? 3-, and twelve ? 2- benzoate groups, as well as twoterminal benzoic acid groups on the CeIII ions.

All MnIII atomsare six-coordinate with distorted octahedral geometries and exhibit Jahn–Teller(JT) distortion axes. The CeIII and CeIV ions arenine-coordinate and eight-coordinate, respectively. Themagnetic studies showed that Ce3Mn8 exhibits both in pairMnIII2 ferromagnetic and antiferromagnetic exchangeinteractions and the resultant spin vector alignments were within the 3-DC-type antiferromagnetic perovskite. Also from first-principles theoreticalcalculations, it was revealed that the expected nearest-neighbor MnIII2exchange couplings via superexchange pathways through bridging ligands and anunusual, direct MnIII–CeIV–MnIIImetal-to-metal channel involving the CeIV f orbitals. I would like to carryout research mainly on the synthesis of perovskites involving cerium atom andfind their application in various fields. The various oxidation state of ceriumhelps to use cerium as a catalyst.

Also they exhibit colossal magnetoresistanceand multiferroicity, therefore these materials have potential applications inmany technological ? elds such as spintronics and information storage. , Refrences: 1.      GangLiu, Jiaqi Li, Kun Yang, Wenxiang Tang, Haidi Liu, Jun Yang, Renliang Yue??, Yunf Chen? Particuology 2015, 19, 60–682.      Chong-Heng He†, O-Bong Yang\* Ind.

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