SYNTHESIS, CHARACTERISATION AND RESISTIVITY OF PERVOSKITE COMPOUND LaMnx CuY Co1-x-y O3-d (x=0.2 y=0.20)LaMn1-X-Y CuXCoy O3-d (x=0.2 y=0.20)LaMn1-x-y CuxNiyO3-d(x=0.2 y=0.20)

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ABSTRACT

Perovskite materials are the newest contender for breaking the silicon ceiling in solar cell technology. But they don't just absorb light. Cambridge researchers have found they emit it like a laser, opening up an entirely new field of applications."Perovskite is a term used to describe a group of materialas that have a distinctive crystal structure of cuboid and diamond shapes. They have long been of interest for their superconducting and ferroelectric properties. But, in the past five years, it was discovered that they are also remarkably efficient at absorbing photons of light and that this can be converted into an electric current in photovoltaic solar cells.How can they revolutionise our daily lives?Thanks to the unique properties of perovskites, i.e. flexibility, transparency and very low weight, each of us will be carrying several appliances or items integrated with perovskites.They have long been of interest for their superconducting and ferroelectric properties.
In this work I made an attempt synthesize, characterise and to find out the resistivity of above mentioned pervoskite material in the low temperature region
.

Key words: pervoskite, flexibility ,transference Efficiency, resistivity, superconductivity, orthorhombic. rhombohedral

INTRODUCTION

The perovskite structure is adopted by many oxides that have the chemical formula ABO_3.In the idealized cubic unit cell of such a compound, type 'A' atom sits at cube corner positions (0, 0, 0), type 'B' atom sits at body centre position (1/2, 1/2, 1/2) and oxygen atoms sit at face centred positions (1/2, 1/2, 0). (The diagram shows edges for an equivalent unit cell with A in body centre, B at the corners, and O in mid-edge).Perovskite materials are the newest contender for breaking the silicon ceiling in solar cell technology. But they don't just absorb light. Cambridge researchers have found they emit it like a laser, opening up an entirely new field of applications.Discovered 175 years ago in Russia's mineral treasure box – the Ural Mountains – and named after the mineralogist Count Lev Aleksevich von Perovski, perovskite is fast becoming a 'rock' to be reckoned with. In 2013, the use of perovskite materials in solar cells was voted as one of the breakthroughs of the year by Science magazine; more recently, the Guardian website declared that they "are the clean tech material development to watch right now."Perovskite is a term used to describe a group of materials that have a distinctive crystal structure of cuboid and diamond shapes. They have long been of interest for their superconducting and ferroelectric properties. But, in the past five years, it was discovered that they are also remarkably efficient at absorbing photons of light and that this can be converted into an electric current inphotovoltaic solar cells.A defining moment came in 2012, when Professors Henry Snaith at the University of Oxford and Michael Graetzel at the Federal Institute of Technology Lausanne, building on the work of Tsotomu Mayasaka from Tokyo, found that solar cells with perovskite as the active component could be made with greater than 10% power conversion efficiencies for turning the sun's rays into electrical energy. A mere two years later, Snaith increased this to 17%. For silicon-based solar cells, it's taken 20 years of research to achieve this level.Now, researchers in Cambridge have found another property of this remarkable material – it doesn't just absorb light, it also emits it as a laser.

Solar power is much more expensive than fossil fuels, especially when you factor in its intermittency.A new type of solar cell, made from a material that is dramatically cheaper to obtain and use than silicon, could generate as much power as today’s commodity solar cells.Although the potential of the material is just starting to be understood, it has caught the attention of the world’s leading solar researchers, and several companies are already working to commercialize it.The new material may make it possible to get the best of both worlds—solar cells that are highly efficient but also cheap to make.

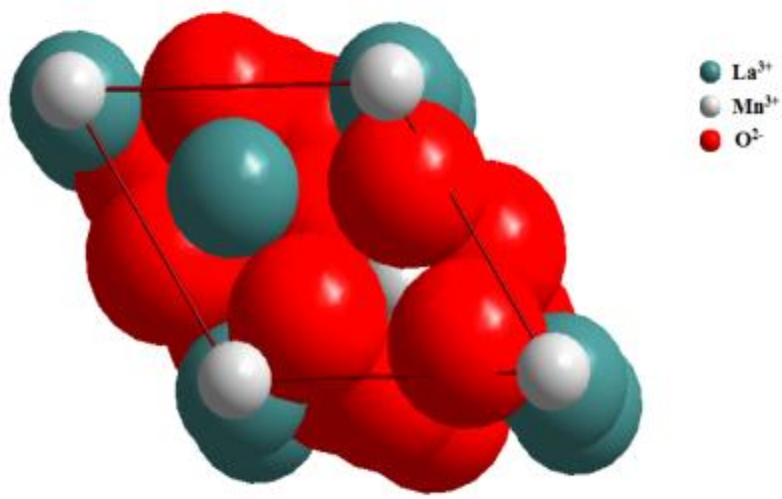
The new material may make it possible to get the best of both worlds—solar cells that are highly efficient but also cheap to make.One of the world’s top solar researchers, Martin Green of the University of New South Wales, Australia, says the rapid progress has been surprising. Solar cells that use the material “can be made with very simple and potentially very cheap technology, and the efficiency is rising very dramatically,” he says.Perovskites have been known for over a century, but no one thought to try them in solar cells until relatively recently. The particular material the researchers are using is very good at absorbing light. While conventional silicon solar panels use materials that are about 180 micrometers thick, the new solar cells use less than one micrometer of material to capture the same amount of sunlight. The pigment is a semiconductor that is also good at transporting the electric charge created when light hits it.“The material is dirt cheap,” says Michael Grätzel, who is famous within the solar industry for inventing a type of solar cell that bears his name. His group has produced the most efficient perovskite solar cells so far—they convert 15 percent of the energy in sunlight into electricity, far more than other cheap-to-make solar cells. Based on its performance so far, and on its known light-conversion properties, researchers say its efficiency could easily rise as high as 20 to 25 percent, which is as good as the record efficiencies (typically achieved in labs) of the most common types of solar cells today. When perovskites were first tried in solar cells in 2009, efficiencies were low—they only converted about 3.5 percent of the energy in sunlight into electricity

"Between 2009 and 2012 there was only one paper. Then in the end of the summer of 2012 it all kicked off," Snaith says. Efficiencies quickly doubled and then doubled again. And the efficiency is expected to keep growing as researchers apply techniques that have been demonstrated to improve the efficiency of other solar cells.

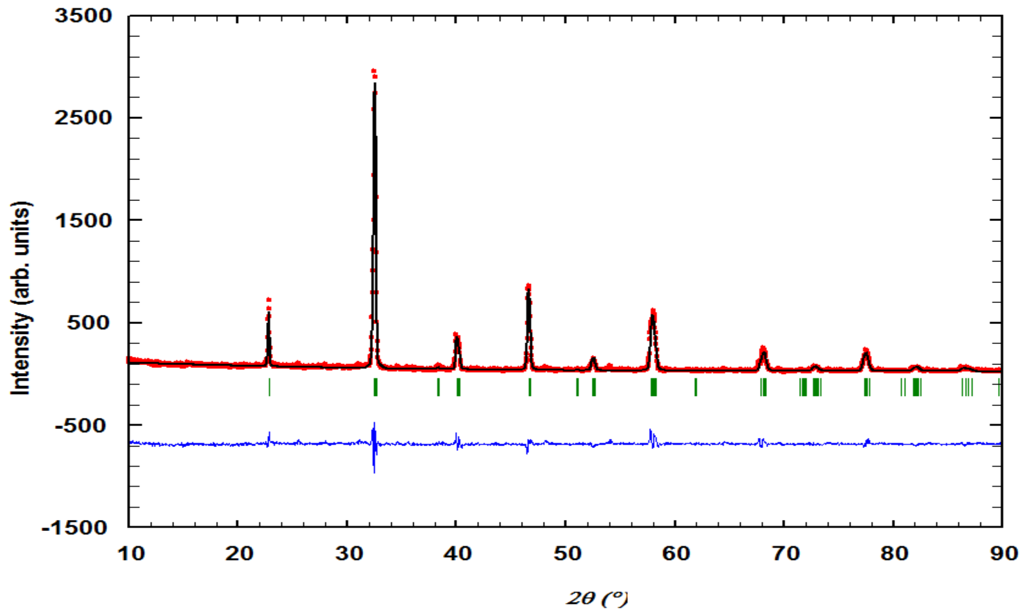
When can this technology reach the general public? We are at the stage of reproducing the best results obtained at the University of Valencia. At the same time, we are preparing patent applications related to the completely revised perovskite production technology, which takes into account processing for industrial production. We do everything as quickly as possible to show the world our cells. However, we need a few more steps to prepare our photovoltaic cells for sale as a product of full value.

How can they revolutionise our daily lives? Thanks to the unique properties of perovskites, i.e. flexibility, transparency and very low weight, each of us will be carrying several appliances or items integrated with perovskites. ade from perovskite. Credit: Zhi-Kuang Tan[Click to enlarge image]Colourful LEDs made from a material known as perovskite could lead to LED displays which are both cheaper and easier to manufacture in future.ade from perovskite.Credit: Zhi-Kuang Tan[Click to enlarge image]Colourful LEDs made from a material known as perovskite could lead to LED displays which are both cheaper and easier to manufacture in future.ade from perovskite.Credit: Zhi-Kuang Tan[Click to enlarge image]Colourful LEDs made from a material known as perovskite could lead to LED displays which are both cheaper and easier to manufacture in future.

Rhombohedral structure of $LaMnO_3$



MATERIALS AND METHODS : XRD report


3500
2500
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Intensity (arb. units)
10
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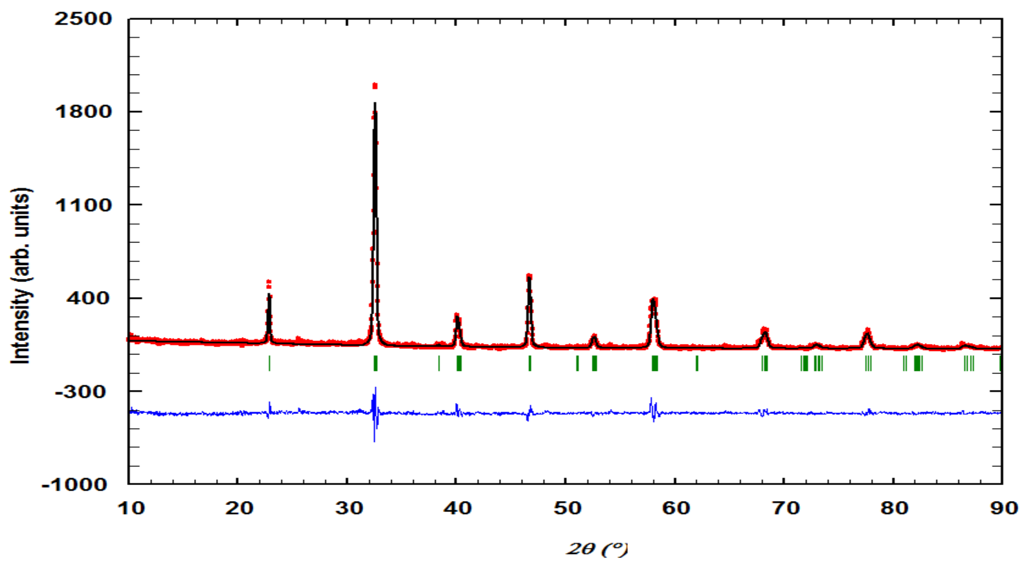
2θ (°)


2500
1800
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400
-300
-1000
Intensity (arb. units)
10
20
30
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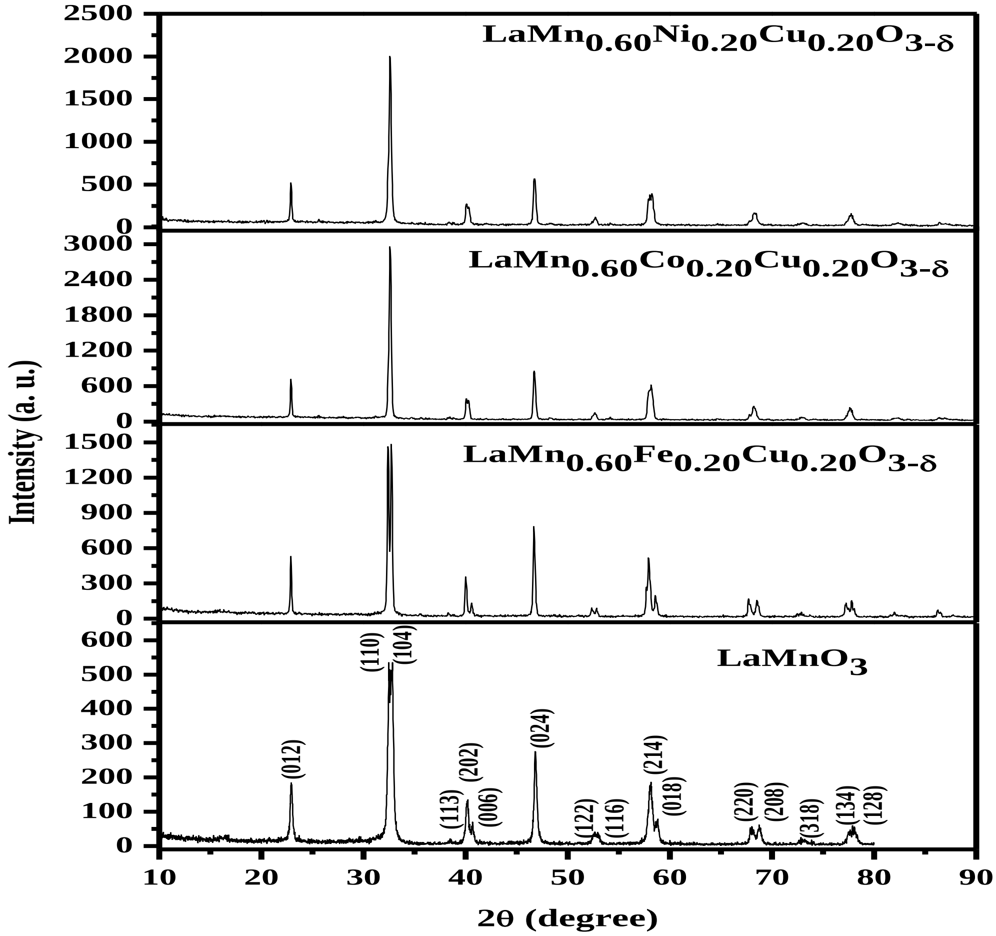
70
80
90
2θ (°)

Rietveld refined parameters

Compounds	a (Å)	c (Å)	R_f	R_B	χ^2
$LaMnO_3$	5.514(6)	13.323(8)	2.5	3.1	1.85
$LaMn_{0.60}Fe_{0.20}Cu_{0.20}O_{3-\delta}$	5.533(2)	13.352(9)	1.9	2.2	1.10
$LaMn_{0.60}Co_{0.20}Cu_{0.20}O_{3-\delta}$	5.518(8)	13.439(1)	2.9	3.2	1.65
$LaMn_{0.60}Ni_{0.20}Cu_{0.20}O_{3-\delta}$	5.512(4)	13.418(2)	2.7	3.3	1.48



CONCLUSION : SYNTHESIZED AND CHARACTERISED NEW PERVOSKITE MATERIAL AND STUDIED ELECTRICAL PROPERTIES.

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