Here we present a new type of solar cell based solely on metal oxides. These thin film cells consist of a transparent conducting oxide substrate (Fluorine doped SnO₂), a wide band gap window layer, an oxide light absorber and a metal back contact, which is the only non-oxide component in the device. The window layer, which is currently TiO₂, was made by using spray pyrolysis and the metal back contact was sputtered. The oxide used as the absorber in the cells is Co₃O₄, which has a band gap of 1.8eV, and was fabricated by pulsed laser deposition (PLD). This method gives us the ability to create a continuous thickness gradient of the individual layers. Optical characterization, I-V analysis, thickness and quantum efficiency measurements were carried out in high throughput scanning systems. We present the successful realization of an all-oxide photovoltaic cell based on a Co₃O₄ absorber with a photovoltage above 400 mV and photocurrent densities in the order of hundreds of micro Ampere per cm².

Influence of the temperature:

Surface morphology:

SEM of the Co₃O₄ surface at 23, 150 600 deg

Current (diffusion length related):

Jsc of devices with Co₃O₄ absorber deposited at 23, 150 600 deg

Voltage:

Voc of devices with Co₃O₄ absorber deposited at 23, 150 600 deg

Conclusion:

Co₃O₄ had been used as a new absorber in an all oxide photovoltaic cell. It had been deposited by Pulsed laser deposition and the gradient shape deposition is used in order to detect optimum thickness of the absorber. The Jsc and Voc are shown to be highly dependant of the deposition temperature. At high temperature, the Co₃O₄ become more crystalline allowing Voc and Isc of our devices to increase.