Melt grown black Titanium Oxide: Novel optoelectronic material

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Titanium oxides (TiO_x) have been enthusiastically studied as a light absorber, electron-transporting material and catalyst in different energy and environmental applications. The discovery of ''black'' TiO_x (b-TiO_x) with visible and infrared absorption has triggered an explosion of interest due to the its great application potential for energy applications [1] [2]. After discovery of b-TiO_x, its synthesis became a hot area in the current environmental perspective. Different synthesis strategies have been employed up to now [3], however, all these processes including hydrogenation, are multi-step and time consuming.

Here, b-TiO_x crystal has been successfully grown from the melt, for the first time without a subsequent hydrogenation process. Electrical characterization of this material shows the resistivity as low as ~0.1 Ohm.cm due to the presence of Magnéli phases of TiO_x. By selective annealing of the material, the electronic properties as well as the colour of the material, can be precisely controlled.

The authors thank the ENSEMBLE[3] Project (MAB/2020/14) which is carried out within the International Research Agendas Programme (IRAP) of the Foundation for Polish Science co-financed by the European Union under the European Regional Development Fund, the Teaming Horizon 2020 programme (GA. No. 857543) of the European Commission, and the Indo-Poland bilateral project (PPN/BIN/2019/1/00111) by the Polish National Agency for Academic Exchange (NAWA).

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