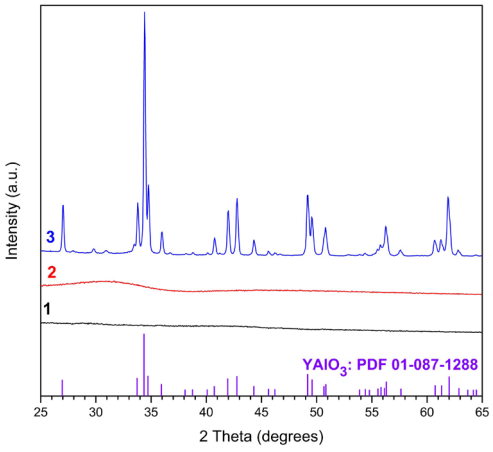
INNOVATIVE SOLUTIONS IN THE FIELD OF LARGE SURFACE AREA CERAMIC NANOPOWDER PREPARATION VIA COMBUSTION SYNTHESIS

Goal of the project

Preparation of ceramic powders with controlled properties under advantageous conditions using the solution combustion synthesis: BaAl2O4, Al2TiO5, Z nAl2O4, LaAlO3 or YAlO3. T he project proposes several innovative solutions, which will optimize the combustion method, thus allowing the preparation of nanocrystalline compounds of practical interest, with large surface area. The project is expected to have a high impact and lead to remarkable scientific and economical results.

Short description of the project

The project approaches the preparation of some ceramic powders, which currently develop high economical interest for a number of applications: BaAl2O4, Al2TiO5, Z nAl2O4, LaAlO3 or YAlO3. With a view to obtain the designed powders with tailored properties (as for example crystalline nanopowders with large surface area) in the most advantageous conditions directly from the reactions, with no supplementary conditioning being needed, solution combustion synthesis route is being explored and improved according to the specific of each reaction product. The obtained results are disseminated and confirmed at the same time within the scientific community by communications made during international conferences from the country and abroad, as well as articles published in ISI-ranked journals. At the same time, some results represent the basis of a patent proposal. Project funding is also used for acquiring laboratory equipments to support the research work developed by the implementation team.



Project implemented by

Politehnica University of Timisoara.

Implementation period

01.10.2011 - 30.09.2014

Main activities

The whole system consisting of radar sensor, sensor fusion, risk assessment and vehicle control has a high potential to be launched in serial cars because the majority of components is already standard equipment in series cars. The additional equipment required should not be a show-stopper from a pure technical point of view.
Measures for VRU protection might be divided into passive and active systems. Because of basic physical properties, passive measures can provide limited protection potential only. Therefore (active) actuators are necessary to achieve the desired protection for VRUs. For example, vehicle deceleration seems to be a potential approach for active VRU protection with high benefit and high potential for high volume series cars, as they are already in use in high-end limousines.
The environmental sensing will be conducted with a novel high performance but low-cost 24 GHz narrowband radar system. From an operational viewpoint, this RF frequency fits exactly into the existing ISM band from 24,000 GHz to 24,250 GHz. Due to this techno-political feature this radar has a long term perspective on European and world-wide markets.

Results

Two article published in ISI-ranked journals:

- Chemical oxidation of residual carbon from Z nAl2O4 powders prepared by combustion synthesis, Robert Ianoş, Radu Lazău, Ioan Lazău, Cornelia Păcurariu, Journal of the European Ceramic Society 32(8), July 2012, Pages 1605–1611, Impact Factor: 2.360, Relative Influence Score - 4.076.
- Nanocrystalline BaAl2O4 powders prepared by aqueous combustion synthesis, Robert Ianoş, Radu Lazău, Roxana Băbuță, Silvana Borcănescu, Cristian Boruntea, Ceramics International, 39(3) April 2013, Pages 2645-2650, Impact Factor: 1.789, Relative Influence Score - 2.688.

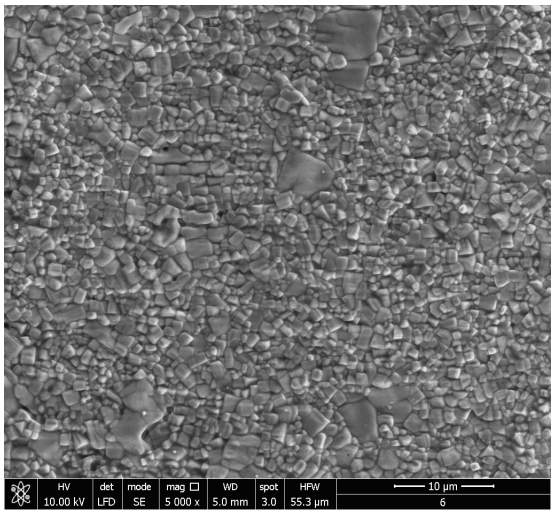
Four papers communicated within international scientific meetings from abroad and four papers communicated within international scientific meetings from the country.
Two literature studies.

Applicability and transferability of the results

The results achieved within the project may represent the starting point for industrial applications in the synthesis of the approached compounds. Therefore, the results are disseminated and subjected to scientists and technician's attention using large visibility ISI-ranked journals and international conferences, which are representative for the research field. A patent proposal is also in progress. The results may also be transferred to the students as part of their training in the field of micro and nanomaterials, ceramics synthesis and processing or multifunctional intelligent materials.

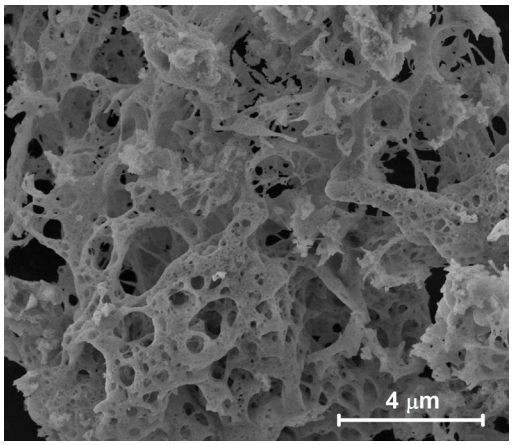
Fields of interest

Ceramic nanopowders preparation, solution combustion synthesis, zinc spinel, alkaline earth and rare earth aluminates, tialite, yttrium aluminate, perowskites, phosphor materials.



Research centre

Research Centre for Inorganic Materials and Alternative Energies



Financed through/by

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Research team

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Lazău Radu - researcher
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