ADVANCED MATERIALS BASED ON COMBUSTION-SYNTHESIZED MAGNETIC IRON OXIDES NANOPARTICLES AND THEIR CYTOTOXICITY DESIGNED FOR CANCER TREATMENT

Goal of the project:

- Obtaining of magnetic iron oxides nanoparticles using the combustion synthesis method and monitoring the influence of several working parameters: fuel type (EDTA, citric acid, glucose), oxidant/fuel molar ratio (fuel-rich compositions), ignition procedure (heating mantle, microwave field), working atmosphere (in air/no air), carbon and organic residues presence.
- Preparation of colloidal suspensions.
- The assessment of the toxicological profile/biological activity of the iron oxide colloidal suspensions on normal/tumour liver and kidney cell lines.

Short description of the project

The project presents the preparation of iron oxides with via combustion synthesis and testing their selective cytotoxicity.

Project implemented by

Department of Applied Chemistry and Engineering of Inorganic Compounds and Environment,
Faculty of Industrial Chemistry and Environmental Engineering, Politehnica University Timisoara

Implementation period

July 2017-December 2019

Main activities

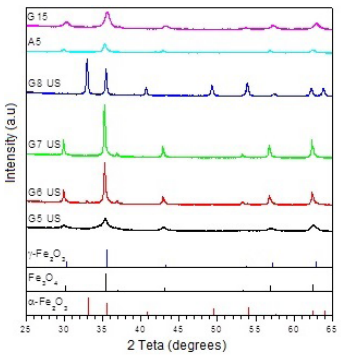
Combustion synthesis of magnetic iron oxides nanoparticles.
The influence of several parameters on the powders characteristics were pursued:

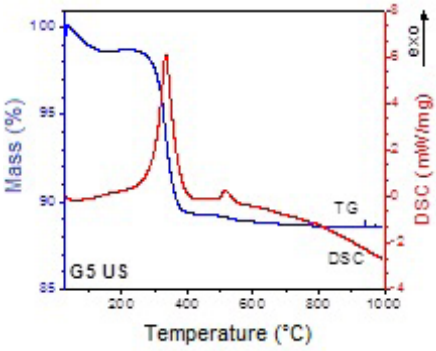
- nature of the fuel: glucose, citric acid, EDTA, TWEEN 80, hexamethylenetetramine
- reaction conditions: presence and absence of air
- carbon and organic residues presence and chemical oxidation removal using H_2O_2

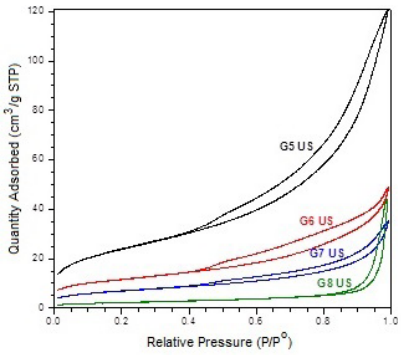
Characterization of magnetic iron oxides nanoparticles:

- combustion reactions evolution was assessed by TG-DSC thermal investigations
- the phase composition of the synthesized compounds was investigated by XRD
- specific surface area (BET)
- FTIR spectroscopy

The obtained results were centralized and interpreted for recipes optimization.







Results:

Synthesis protocols and recipes for 31 samples prepared by combustion synthesis. It was established the influence of different fuels (glucose, citric acid, EDTA, TWEEN 80, hexamethylenetetramine) and of the reaction conditions on the synthesis of iron oxides with magnetic properties.

Applicability and transferability of the results

These researches open an entirely new perspective on the potential use of combustion-synthesized iron oxide nanoparticles in cancer therapy by selective cytotoxicity.
The results will be subjected to a patent application.

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Research Center

Research Centre for Inorganic Materials and Alternative Energies

Research team

1. Cornelia Pacurariu - project leader
2. Cristina Dehelean - experienced researcher
3. Robert Ianos - experienced researcher
4. Radu Lazau - experienced researcher
5. Dorina Coricovac - postdoc researcher
6. Alina Moaca - postdoc researcher
7. Roxana Babuta (Racoviceanu) - postdoc researcher
8. Eliza Muntean - PhD student
9. Aylin Capraru - PhD student

Contact information

Prof. Cornelia PĂCURARIU, PhD
Faculty/Department Address: Bd.V. Pîrvan, No.6 Postal Code 300223, Timisoara
Phone: (+40) 256 404 144
Mobile:+40 722 54 75 18
E-mail: cornelia.pacurariu@upt.ro
Web: http://www.chim.upt.ro/ro/caicam