7TH INTERNATIONAL CONFERENCE ON ADVANCED MATERIALS AND SYSTEMS
18-20 October, Bucharest, Romania
MINISTERUL CERCETĂRII ȘI INOVĂRII

SELF-CLEANING PROPERTIES OF COTTON GAUZES IMPREGNATED WITH CALCIUM ALGINATE/TiO_2-Ag/REDUCED GRAPHENE OXIDE COMPOSITE

MARCELA-CORINA ROSU[1], CRINA SOCACI[1], ALIN-SEBASTIAN PORAV[1], ALEXANDRU TURZA[1], LAURA CHIRILA[2], CARMEN GAIDAU[2], DANIEL TIMPU[3], ALICE-ORTANSA MATEESCU[4], IOANA-RODICA STANCULESCU[4]

INCDTIM

[1] *National Institute for Research and Development of Isotopic and Molecular Technologies, 67-103 Donat Street, 400293, Cluj-Napoca, Romania, email: marcela.rosu@itim-cj.ro*
[2] *National Research & Development Institute for Textiles and Leather, 16 Lucretiu Patrascanu Street, 030508, sector 3, Bucharest, Romania, email: chirila_laura@yahoo.com*
[3] *"Petru Poni" Institute of Macromolecular Chemistry, 41A Grigore Ghica Voda Alley, 700487 Iasi, Romania, email: dtimpu@iccpp.ro*
[4] *"Horia Hulubei" National Institute for Research and Development in Physics and Nuclear Engineering, 30 Reactorului Street, 077125, Magurele, Romania, email:amateescu@niham.nipne.ro*

INTRODUCTION

Treatment of fabrics with various additives (organic/inorganic nano-structured materials) shows a growing interest for domestic and industrial use due to self-cleaning, antimicrobial and anti-pollution characteristics. Nano-modified fabrics using photocatalytic materials have a vast potential for the development of new products from self-cleaning fabrics for consumer to filter membranes for separation field and/or photocatalytic degradation of various dyes from wastewater. TiO_2-based materials are a reliable choice to provide photocatalytic properties considering the special properties of TiO_2 (i.e., chemical and photo stability, non-toxicity, lower cost, etc.).

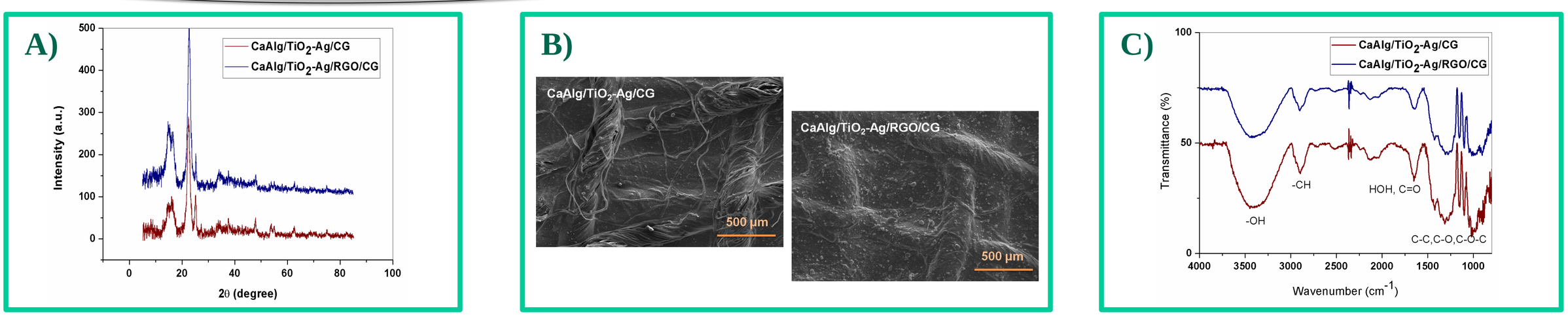
EXPERIMENTAL

***Preparation** of composite-treated cotton gauzes*

The composite powders (TiO_2-Ag and TiO_2-Ag/RGO) were dispersed into a 2% aqueous solution of sodium alginate (8 mg/ml) and were sonicated for 15 min. The cotton gauze specimens (2cm x 3cm 6-fold 1 sheets) were impregnated with these two prepared dispersions (4 ml/each piece of cotton gauze). Thereafter, the specimens were immersed in 4% $CaCl_2$ aqueous solution for cross-linking and thus, obtaining insoluble Ca-alginate with TiO_2 immobilized on them. After one day, all gauze cotton specimens were removed from $CaCl_2$ aqueous solution and were dried at 25°C in an oven for 24 h. The resulting materials were denoted as CaAlg/TiO_2-Ag/CG and CaAlg/TiO_2-Ag/RGO/CG. A cotton gauze specimen impregnated with calcium alginate matrix without composites was prepared as control specimen (CaAlg/CG).

Cotton gauze specimens:
a) CG; b) CaAlg/CG; c) CaAlg/TiO_2-Ag/CG; d) CaAlg/TiO_2-Ag/RGO/CG

***Characterization** of composite-treated cotton gauzes*

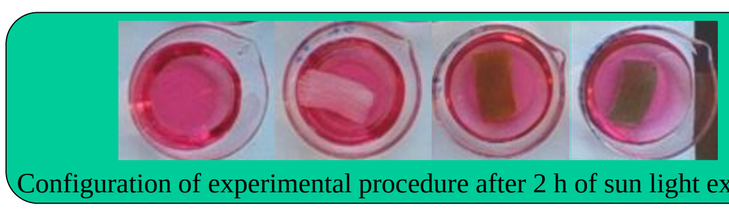


A) X-ray diffraction profiles ; B) SEM images; C) FTIR spectra of CaAlg/TiO_2-Ag/CG and CaAlg/TiO_2-Ag/RGO/CG.

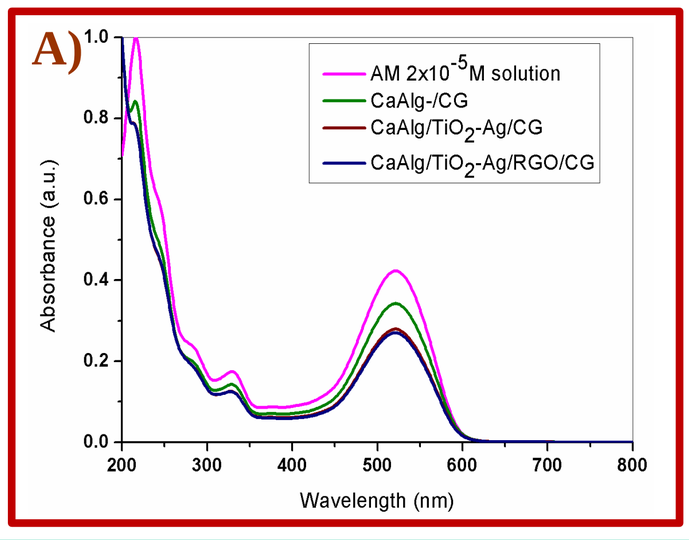
Photocatalytic analysis* of *composite-treated cotton gauzes

The photocatalytic behavior of the composite-treated cotton gauzes was evaluated by photodegradation of amaranth dye solution under sun light exposure.

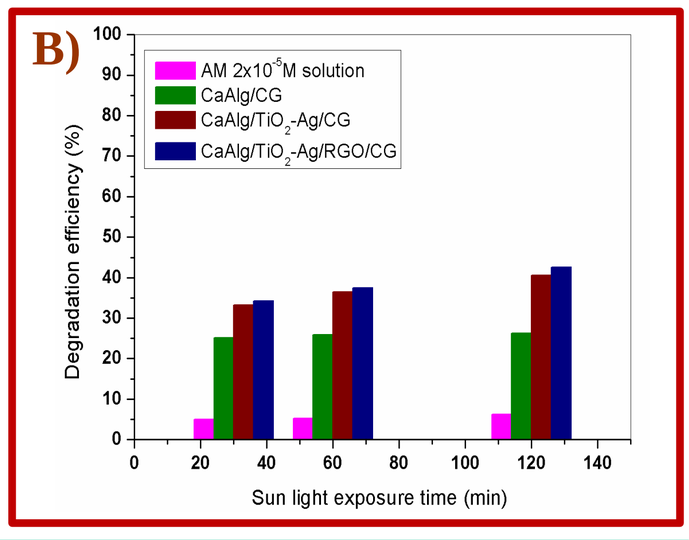
Configuration of experimental procedure before sun light exposure.



Configuration of experimental procedure after 2 h of sun light exposure.



A) *UV-VIS spectra*
B) *Degradation efficiency* of composite-treated cotton gauzes after 2 h of sun light exposure.



CONCLUSION

The TiO_2-Ag and TiO_2-Ag/RGO-treated cotton gauzes impregnated in calcium alginate matrix have been prepared to compare their photodegradation efficiencies. The photodegradation of amaranth dye over TiO_2-based composite treated cotton gauzes is improved under exposure of sun light. This result highlights the potential of obtained composites to use in the development of self-cleaning photocatalytic cotton fabrics. Further experimental studies will be considered in order to determine the optimum conditions for maximizing amaranth dye degradation using the TiO_2-Ag/RGO based composites.

Acknowledgments:
This work was supported by a grant of Romanian Ministry of Research and Innovation, CCCDI – UEFISCDI, Project number PN-III-P1-1.2-PCCDI-2017-0743/44PCCDI/2018, within PNCD III.
The SEM investigation was supported using the infrastructure obtained in the project Research Center and Advanced Technologies for Alternative Energies - CETATEA - 623/11.03.2014.