The influence of the vacuum plasma treatment on the cotton surface deposited by TiO_2/ TO_2+graphene nanopowder water colloidal dispersions

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Introduction

The influence of the vacuum plasma treatment on the deposited surfaces of cotton samples by their immersion in TiO_2 and TiO_2+graphene water colloidal dispersions

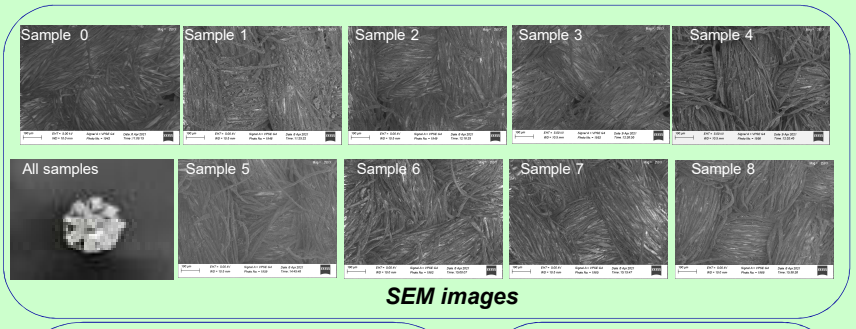
Experimental

* Sample no.	0	1	2	3	4
Type of Sample	Blank	** Immersed in TiO2 *** dispersion(1%)	**** Treated in vacuum plasma (air) → Immersed in TiO2 dispersion(1%)	Treated in vacuum plasma (air) → Immersed in TiO2 dispersion(1%) → Treated in vacuum plasma (air)	Immersed in TiO2 dispersion(1%) → Treated in vacuum plasma (air)
Sample no.		5	6	7	8
Type of Sample		Immersed in TiO2+Gr (9:1) dispersion(1%)	Treated in vacuum plasma (air) → Immersed in TiO2+Gr(9:1) dispersion(1%)	Treated in vacuum plasma (air) → Immersed in TiO2+Gr (9:1) dispersion(1%) → Treated in vacuum plasma (air)	Immersed in TiO2+Gr (9:1) dispersion (1%)→ Treated in vacuum plasma (air)

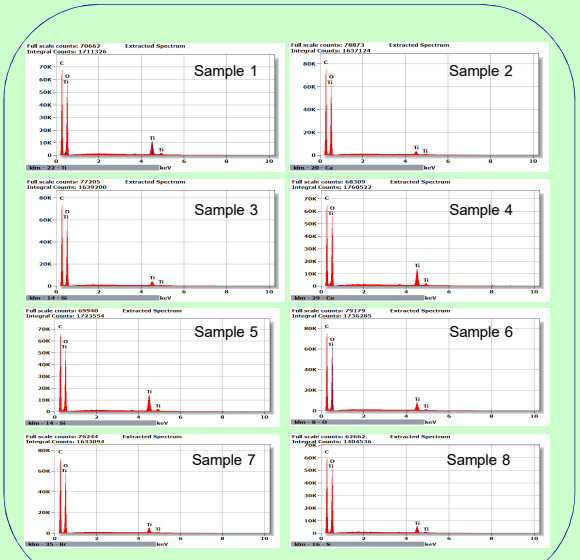
- Cotton
- ** Distilated water
- *** In ultrasound bath
- **** 10 minutes - each side

Vacuum plasma treatment

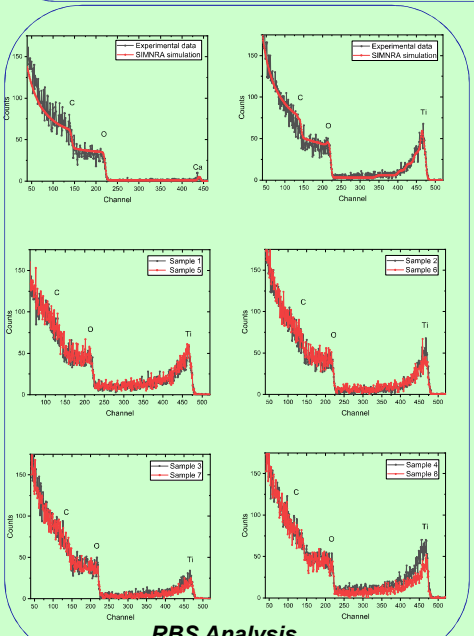
Results



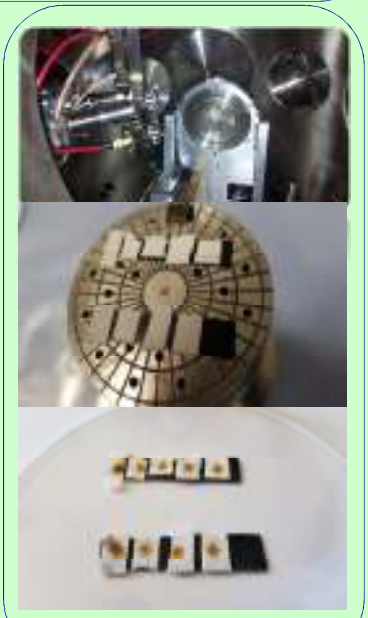
SEM images



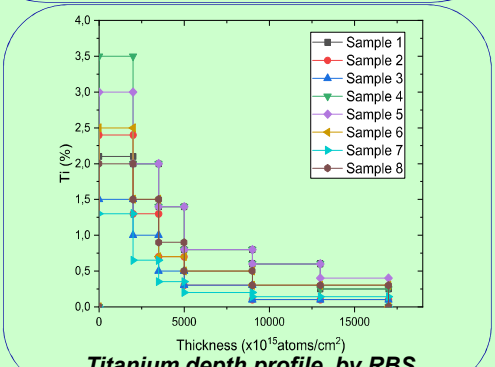
EDS investigation



RBS Analysis



RBS Measurements



Titanium depth profile by RBS

Conclusions

- By both investigation methods (SEM-EDS and RBS) of the samples that were treated after TiO_2 nanopowder deposition process by vacuum plasma one can observe a low reduction of the TiO_2 nanopowdwer quantity, which means, the low adherent to substrate TIO_2 nanoparticles were removed during this treatment, remaining only high adherent TiO_2 nanopowdwers on the cotton surface.
- Improvement of the TiO_2 nanopowdwers adherence to the substrate is due to the stimulative effect in creating chemical bonds between cotton substrate and TiO_2 nanoparticles as a result of the free radicals from substrate and electrical charged nanoparticles that generate stable chemical bonds by their high reactivity.

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