TiO_2 nanotubes/graphene/metal nanoparticles as suitable photocatalyst for degradation of ciprofloxacine/amoxicile as emerging pollutants

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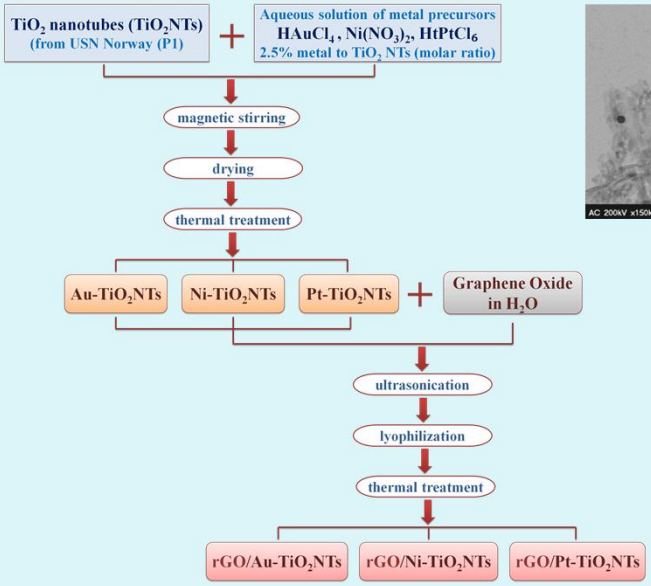
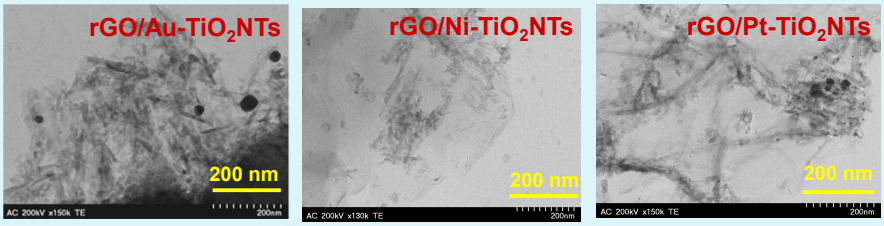
ABSTRACT

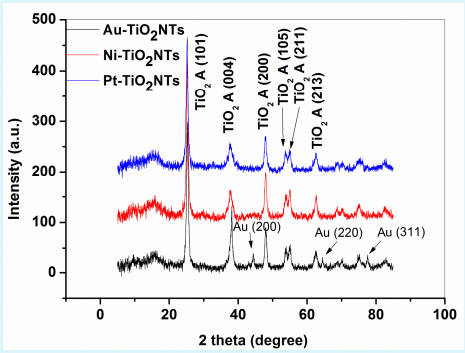
Ternary nanostructures of TiO_2 nanotubes/graphene/metal nanoparticles were successfully synthesized *via* chemical and thermal treatment methods. The photocatalytic ability of resulting ternary nanostructures was investigated on degradation of ciprofloxacine (fluoroquinolone antibiotic) that is frequently detected in aquatic environments. Photocatalytic experiments were performed in a Photoreactor Luzchem LZC-4V using UV and visible light as source of irradiation. Spectroscopic/analytical methods were used to evaluate the photocatalytic processes of ciprofloxacine and amoxiciline degradation. Findings from this study further expand the spectrum of emerging pollutants removal from aquatic systems under photocatalytic conditions.

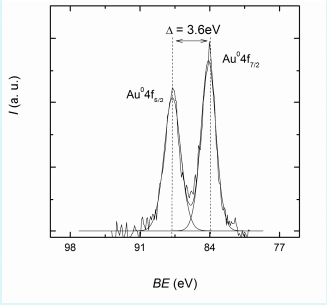
EXPERIMENTAL

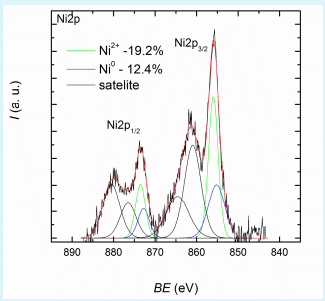


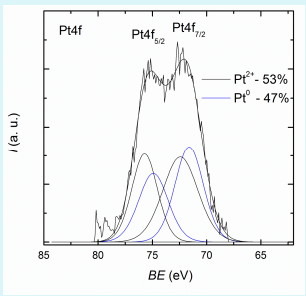
STRUCTURAL AND MORPHOLOGICAL CHARACTERIZATION

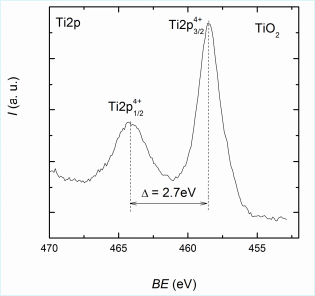




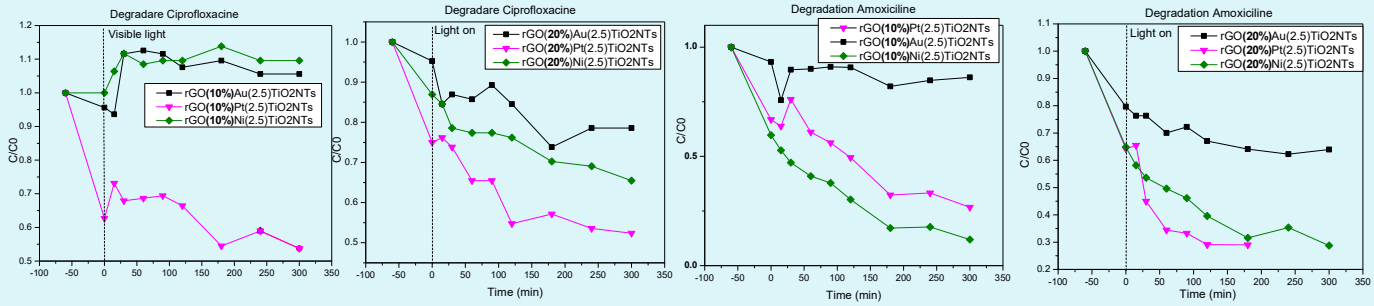








PHOTOCATALYTIC PERFORMANCE



CONCLUSIONS

We have prepared photocatalysts starting from TiO2 nanotubes decorated with Au, Pt or Ni/NiO nanoparticles and reduced graphene oxide (10% and 20% w/w). The composites were characterized by spectroscopic methods and the degree of metal reduction has been evaluated by XPS spectroscopy and TPR. The photocatalytic tests (under visible light) show a good photodegradation efficiency for ciprofloxacine for the platinum composites and a very good one for amoxiciline for both platinum and nickel composites. The graphene ratio plays a role in the degradation processes.

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