

Programme & The Book of Abstracts

Twenty-first Annual Conference

**YUCOMAT 2019**

&

Eleventh World Round Table Conference

on Sintering –

Science of Sintering & Its Future: Fifty Years Later

**WRTCS 2019**

Herceg Novi, Montenegro September 2 - 6, 2019

Organised by



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**Materials Research Society of Serbia**  
&  
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P.S.B.3.

**Thermolysis prepared  $\text{Co}_3\text{O}_4$  carbon paste electrode decorated with single wall nanotubes as voltammetric sensor for determination of antioxidant  $\alpha$ -lipoic acid**

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The novel carbon material modified with  $\text{Co}_3\text{O}_4$  particles, prepared by calcination and mixed with single wall carbon nanotubes, was characterized and used for sensing of prominent antioxidant  $\alpha$ -lipoic acid (LA). The new material was prepared by thermolysis of Novolac phenol-formaldehyde resin and cobalt(III) nitrate mixed with graphite powder, producing mostly glassy carbon decorated with cobalt oxide. XRD and SEM measurements were used to study composition, structure and morphology of cobalt oxide modified carbon material. Impedance spectroscopy measurements indicate higher conductivity of thermolysis prepared  $\text{Co}_3\text{O}_4$  carbon paste electrode with single wall carbon nanotubes (TPC $\text{O}_3\text{O}_4$ CPE/SWCNT) compare to material without nanotubes (TPC $\text{O}_3\text{O}_4$ CPE), while the best voltammetric response of LA was also recorded at TPC $\text{O}_3\text{O}_4$ CPE/SWCNT. In order to find optimal conditions and investigate electrode process, effect of Co content in electrode material, influence of pH and scan rate were studied. The quantification of  $\alpha$ -lipoic acid was done by sensitive square-wave voltammetric technique (SWV). Under the optimized SWV parameters, in Britton Robinson buffer solution at pH 6, the linear range was recorded from 2 to 100  $\mu\text{M}$  of LA. TPC $\text{O}_3\text{O}_4$ CPE/SWCNT electrode exhibits good stability and reputability, too. This new combination of carbon materials, partially self-made, with incorporated Co oxide particles, could be interesting platform for determination of  $\alpha$ -lipoic acid in dietary supplements and pharmaceutical formulations, with sensitivity and selectivity comparable and even better than determinations of this analyte at commercially available carbon electrodes and reported modified electrodes.

P.S.D.3

### **The influence of modification and the particle size of the montmorillonite on the hydrolytic stability of urea-formaldehyde composite**

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Urea-formaldehyde (UF) resin adhesive is a polymeric condensation product of formaldehyde with urea and is considered as one of the most important wood adhesives. In spite of some advantages such as lower cost, fast curing, good performance in the panel, water solubility and being colorless, UF resin adhesives also possess a critical disadvantage: formaldehyde (FA) emission from the panels. Exposure to FA may occur by breathing contaminated indoor air, tobacco smoke, or ambient urban air. Furthermore, the FA emission from the panels used for interior applications is known as one of the main factors causing sick building syndrome in an indoor environment.

Montmorillonite (MMT) clays are of great importance for processes such as adsorption and catalysis and polymer composites fabrication. The textural properties of this filler can be modified to increase its application. In this study, the hydrolytic stability of modified UF resins with modified and unmodified montmorillonites as scavengers of FA, with a different particle size (K10 and KSF), was studied. Five UF composite materials of F/U 0.8 ratio with MMT and Na-MMT were synthesized by the same method. The sensitivity to the hydrolysis of the crosslinked UF resin depends on its chemical nature and the degree of cross-linking. The hydrolytic stability of the investigated modified UF resin was determined by measuring the loss of weight and the concentration of released formaldehyde from the modified UF resin after acid hydrolysis. The obtained results showed improved hydrolytic stability of the modified resin containing unmodified KSF as a scavenger of FA.

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