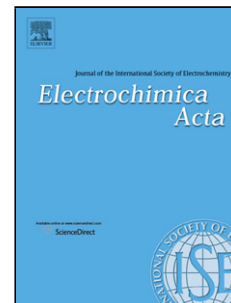


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**Highly sensitive 3D gold nanotube ensembles: Application to electrochemical  
determination of metronidazole**

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**Abstract**

Three-dimensional gold nanoelectrode ensembles (3D GNE) have proven to be promising nanoelectrodes by representing much higher sensitivity compared to both their 2D nanostructures and bulk counterparts. The sensitivity of 3D gold nanotubes (GNT) fabricated through electrodeposition inside the pores of polycarbonate templates, was examined toward metronidazole (MTZ) as one of their pharmaceutical applications. The electrochemical behavior of MTZ at the 3D GNT-modified electrode was discussed in detail through cyclic voltammetry (CV) which suggested an irreversible reduction of nitro group to the corresponding hydroxylamine and a subsequently reversible redox peak for the corresponding product. This latter redox peak was selected for MTZ determination which has not been reported, so far. Square wave voltammetry (SWV) was used as a powerful tool for detection of MTZ in different concentrations. Under the optimal conditions, the highly sensitive 3D GNT showed a wide linear

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