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Fixed-bed catalytic wet peroxide oxidation of phenol with titania and Au/Titania catalysts in dark

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Catalytic wet oxidation of toxic organic compounds in water resulting in their mineralization (removal of TOC) or conversion to nontoxic compounds of high biodegradability is an attractive technology widely used for purification of industrial wastewater. The challenge here is development of solid materials that being leachproof can serve as efficient fillers for "catalytic filters" working in continuous mode with no limited capacity at atmospheric pressure and low temperature. The recently reported high efficiency and leaching resistance of gold nanoparticles supported on hydroxyapatite in catalytic wet peroxide oxidation (CWPO) of phenol in dark answers to these requirements. But strong leaching of Ca and P from the support at acidic pH needed for stable performance of this catalyst limits its life time. Looking for completely leachproof and efficient material for catalytic filters we conducted a comprehensive study of the performance of gold nanoparticles supported on titania in CWPO of phenol. Amazingly it was found that nanocrystalline titanium oxide in anatase form not only serves as a good and completely leachproof support for gold nanoparticles but also display high own catalytic activity in this reaction in dark. The presentation reports relative contribution of both Au and titania components to the performance of Au/TiO₂ composite in CWPO of phenol, factors determining the stability of gold component and the catalysts efficiency in removal of TOC and increasing the biodegradability of toxic organics existed in industrial wastewater.

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