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ANODE MATERIAL COMPARISON AND SELECTION FOR THE EFFICIENT ELECTROCHEMICAL OXIDATION OF PHENOL IN WATER

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Anode materials play a big role in electrochemical oxidation process because they influence not only the effectiveness of oxidation but also degradation pathways and reaction mechanisms. Since the nature of the anode material can affect the oxidation process, many investigations are going on different types of anodes such as traditional anodes and dimensionally stable anodes (DSAs) etc. Chemical stability and good electro catalytic activity of anodes are mainly concerned and these properties are closely related to the anode surface material and various types of metal oxides have been tested in this regard.

However, limited studies have been reported towards the development of anode materials for the detection of specific contaminants such as phenol in water. Therefore, the aim of this study is to compare and identify anode material(s) for efficient electrochemical mineralization of phenol, as a model compound. In order to accomplish the above objective, anode materials of IrO_2 and IrO_2-Sb_2O_3 were fabricated on steel and Ti substrates and there activity towards the adsorption of phenol were compared. Chemical oxygen demand and hydroxyl radical generation capacity studies in the presence of phenol revealed that the anodes fabricated on Ti exhibit higher activity than those on steel substrate. Further, addition of Sb_2O_3 to the original anode materials enhanced the activity towards the reaction with phenol as revealed by the cyclic voltammetric studies. Anodic charge variation sequence was observed in the order of steel < steel/IrO_2 < steel/IrO_2-Sb_2O_3 < Ti/IrO_2 < Ti/IrO_2-Sb_2O_3 suggesting that the Ti/IrO_2-Sb_2O_3 as the best anode for removing phenol among the anode materials tested.