TiN 중간층을 이용한 수처리용 BDD 전극

Reactive sputtered tin adhesion for wastewater treatment of BDD electrodes

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초 록: For several decades, industrial processes consume a huge amount of raw water for various objects that consequently results in the generation of large amounts of wastewater. There effluents are mainly treated by conventional technologies such are aerobic, anaerobic treatment and chemical coagulation. But, there processes are not suitable for eliminating all hazardous chemical compounds form wastewater and generate a large amount of toxic sludge. Therefore, other processes have been studied and applied together with these techniques to enhance purification results. These techniques include photocatalysis, absorption, advanced oxidation processes, and ozonation, but also have their own drawbacks. In recent years, electrochemical techniques have received attention as wastewater treatment process that show higher purification results and low toxic sludge. There are many kinds of electrode materials for electrochemical process, among them, boron doped diamond (BDD) attracts attention due to good chemical and electrochemical stability, long lifetime and wide potential window that necessary properties for anode electrode [1-3].

So, there are many researches about high quality BDD, among them, researches are focused BDD on Si substrate [4]. But, Si substrate is hard to apply electrode application due to the brittleness and low life time. And other substrates are also not suitable for wastewater treatment electrode due to high cost. To solve these problems, Ti has been candidate as substrate in consideration of cost and properties.

But there are critical issues about adhesion that must be overcome to apply Ti as substrate. In this study, to overcome this problem, TiN interlayer is introduced between BDD and Ti substrate. TiN has higher electrical and thermal conductivity, melting point, and similar crystalline structure with diamond. The TiN interlayer was deposited by reactive DC magnetron sputtering (DCMS) with thickness of 50 nm, 1 μm. The microstructure of BDD films with TiN interlayer were estimated by FE-SEM and XRD. There are no significant differences in surface grain size despite of various interlayer. In wastewater treatment results, the BDD electrode with TiN (50nm) showed the highest electrolysis speed at livestock wastewater treatment experiments. It is thought to be that TiN with thickness of 50 nm successfully suppressed formation of TiC that harmful to adhesion. And TiN with thickness of 1 μm cannot suppress TiC formation.