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論文題目

Corrosion-reconstruction bonding of freestanding ultrathin glass film on metal at room temperature

Chapter 1: Introduction

In this chapter, glass material, freestanding ultrathin glass, glass coating and coating technique are introduced. The advantages and disadvantages of glass coating methods are shown to emphasize the importance of developing a glass coating method operating at room temperature with simple process.

Chapter 2: Strong bonding of 45S5 ultrathin glass film on Ti plate at room temperature

In this chapter, room temperature glass coating method was developed which successfully coated 45S5 glass on Ti plate. 45S5 ultrathin glass films, prepared by glass blowing technique, were used as coating material. Strong bonding between 45S5 ultrathin glass films and Ti was obtained by using water as bonding agent at room temperature.

Chapter 3: Corrosion-reconstruction bonding mechanism of 45S5 ultrathin glass film on Ti plate at room temperature

In this chapter, the bonding mechanism between 45S5 glass films and Ti plate was investigated. The surface of 45S5 glass films was found containing a surface Na_2O -rich layer. The bonding interface was investigated by XPS, TEM in detail. A corrosion-reconstruction bonding mechanism, in which the surface Na_2O -rich layer was important, was proposed for the room temperature bonding of 45S5 glass films on Ti plate.

Chapter 4: Fabrication of multi-layer structure of 45S5 ultrathin glass films by corrosion-reconstruction bonding

In this chapter, multi-layer structure of 45S5 ultrathin glass films was prepared by the corrosion-reconstruction bonding. The corrosion-reconstruction bonding was applicable for the glass-glass bonding. The bonding interface was investigated by TEM and XAFS, an interfacial layer between bonded glass films was formed, and the polymerization was observed by XAFS.

Chapter 5: Surface of ultrathin glass film of silicate and phosphate glasses

In this chapter, ultrathin glass films of silicate and phosphate glasses were prepared by glass blowing technique, the glass film surface was investigated by XPS. Glass films could be all fabricated, the surface Na_2O -rich layer, existed in 45S5 glass films, was observed in glasses with higher Na_2O content and lower SiO_2 content in silicate glass. While phosphate glass contained no surface Na_2O -rich layer.

Chapter 6: Glass composition for strong bonding of corrosion-reconstruction bonding on Ti plate at room temperature

The bonding strength for the corrosion-reconstruction bonding of glass films in chapter 5 on Ti

plate was investigated. Stronger bonding was observed in silicate glasses with high content of Na_2O and low content of SiO_2 . The Na_2O content and solubility in water were thought the main factor influencing the bonding strength in silicate glass. The phosphate glass exhibited high bonding strength.

Chapter 7: Potentiality of freestanding ultrathin glass films and the corrosion-reconstruction bonding technique

The characteristics of freestanding ultrathin glass films and corrosion-reconstruction bonding were summarized. The potentiality of freestanding ultrathin glass films and corrosion-reconstruction bonding technique was briefly introduced.