

Public Abstract

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Title:Investigation of Plasma/Ion Vapor Deposition (IVD) Hybrid Coatings for Corrosion Protection and Plasma Destruction of Oral Bacteria

This dissertation reports the results obtained in investigating the use of coatings created in a vacuum plasma to protect aluminum coated steel, produced using ion vapor deposition (IVD), from corrosion and hydrogen re-embrittlement. A hybrid vacuum coater that produces both IVD and plasma coatings was constructed and the resultant coatings were evaluated for corrosion performance and possible contamination. Plasma coatings successfully protected against corrosion and hydrogen re-embrittlement. Producing coatings in the hybrid reactor did not cause contamination or detrimental effects to either plasma coatings or IVD aluminum. Plasma coatings may be a low cost and effective alternative to carcinogenic chromate conversion coatings.

A direct current powered brush shaped plasma source was constructed that operates at atmospheric pressure and near body temperature. The plasma brush was used to sterilize oral bacteria seeded on the enamel analogue hydroxyapatite and on human dentin slices. Plasma rapidly sterilized bacteria in a line-of-sight manner. The mechanisms of sterilization were investigated. Plasma sterilization is considered for caries prevention and caries restoration.