

Title: Preparation and properties of chrome-free corrosion resistant coatings for oriented silicon steel

取向硅钢无铬耐蚀涂层的制备及其性能研究

Abstract: An environmentally friendly chromium-free insulating coating suitable for oriented silicon steel is prepared by using aluminum dihydrogen phosphate, silica sol, water-based resin, sodium tetraborate and graphene aqueous dispersion as main raw materials. The corrosion resistance, insulation properties and magnetic properties of the insulating coating was investigated by using water contact angle measurer, electrochemical tester, neutral salt spray tester, surface insulation resistance and magnetic properties measurers. The results show that the surface of the insulating coating is flat; the addition of graphene can effectively improve the corrosion resistance and magnetic properties of the coating. The corrosion rate in the salt spray test is less than 10% at 120h, and the core loss is reduced by 9.56%. The addition of the graphene did not destroy the insulation properties of the coating. The surface insulation resistance of the coating is $269.51 \Omega \cdot \text{cm}^2 / \text{sided}$.

以磷酸二氢铝、硅溶胶、水性树脂、四硼酸钠和石墨烯水分散液为主要原料制备出一种适用于取向硅钢的环保型无铬绝缘涂料，通过水接触角测量、电化学测试、中性盐雾试验、表面绝缘电阻和磁性能测量研究了绝缘涂层的耐蚀性能、绝缘性能及磁性能。结果表明，绝缘涂层表面均匀平整；石墨烯的加入能有效提高涂层的耐腐蚀性能和磁性能，盐雾试验中 120h 腐蚀率低于 10%，并降低 9.56%

的铁芯损耗，同时石墨烯的加入不会影响涂层绝缘性能，涂层的表面绝缘电阻为
269.51 $\Omega\cdot\text{cm}^2/\text{面}$ 。