

ABSTRAK

Baja AISI 1045 banyak digunakan pada industri pertanian, namun memiliki kelemahan terhadap korosi, terutama dilingkungan air sawah. Penelitian ini bertujuan menganalisis pengaruh variasi waktu pelapisan galvanis terhadap laju korosi dan kekerasan permukaan baja AISI 1045 di air sawah. Metode yang digunakan adalah *Hot Dip Galvanizing* dengan variasi waktu pelapisan 5, 7, 10, 15, dan 20 menit. Pengujian meliputi laju korosi menggunakan metode immersi, uji kekerasan *Rockwell*, dan analisis morfologi permukaan menggunakan *Scanning Electron Microscopy* (SEM). Hasil penelitian menunjukkan pelapisan galvanis secara signifikan menurunkan laju korosi baja AISI 1045 dari 18,05 mm/y (tanpa pelapisan) menjadi 1,54 mm/y pada pelapisan 20 menit. Nilai kekerasan tertinggi diperoleh pada pelapisan 5 menit sebesar 75,85 HRB, disusul pelapisan 10 menit sebesar 74,86 HRB. Hasil analisis SEM menunjukkan pertumbuhan struktur kristal seng semakin besar seiring penambahan waktu pelapisan, dengan permukaan lapisan yang merata dan halus. Namun, pada waktu pelapisan terlalu lama, muncul potensi retakan mikro akibat tegangan termal pada lapisan seng. Berdasarkan hasil penelitian, pelapisan galvanis selama 10 menit direkomendasikan sebagai waktu optimal karena memberikan laju korosi rendah, kekerasan tinggi, lapisan merata, dan potensi retakan mikro yang minim, sehingga efektif meningkatkan ketahanan korosi baja AISI 1045 dilingkungan air sawah secara efisien.

Kata kunci: Baja AISI 1045, galvanisasi, laju korosi, kekerasan, SEM, air sawah.

ABSTRACT

AISI 1045 steel is widely used in the agricultural industry but has weaknesses against corrosion, particularly in paddy field water environments. This study aims to analyze the effect of varying galvanizing coating times on the corrosion rate and surface hardness of AISI 1045 steel in paddy field water. The method used is Hot Dip Galvanizing with coating times of 5, 7, 10, 15, and 20 minutes. The tests conducted include corrosion rate testing using the immersion method, Rockwell hardness testing, and surface morphology analysis using Scanning Electron Microscopy (SEM). The results show that galvanizing significantly reduces the corrosion rate of AISI 1045 steel from 18.05 mm/y (uncoated) to 1.54 mm/y with a 20-minute coating. The highest hardness was obtained with a 5-minute coating at 75.85 HRB, followed by a 10-minute coating at 74.86 HRB. SEM analysis shows that the zinc crystal structure grows larger as the coating time increases, with a smooth and even surface layer. However, excessive coating time may result in microcracks on the zinc layer due to thermal stresses. Based on the results, a 10-minute galvanizing coating is recommended as the optimal time since it provides a low corrosion rate, high hardness, an even coating surface, and minimal microcrack potential, making it effective and efficient in enhancing the corrosion resistance of AISI 1045 steel in paddy field water environments.

Keywords: AISI 1045 steel, galvanizing, corrosion rate, hardness, SEM, paddy field water.