TUGAS AKHIR

PENGARUH PELAPISAN RESIN EPOXY PADA PLA+ DARI KOMPOSIT SANDWICH TERHADAP KEKUATAN BENDING KOMPOSIT

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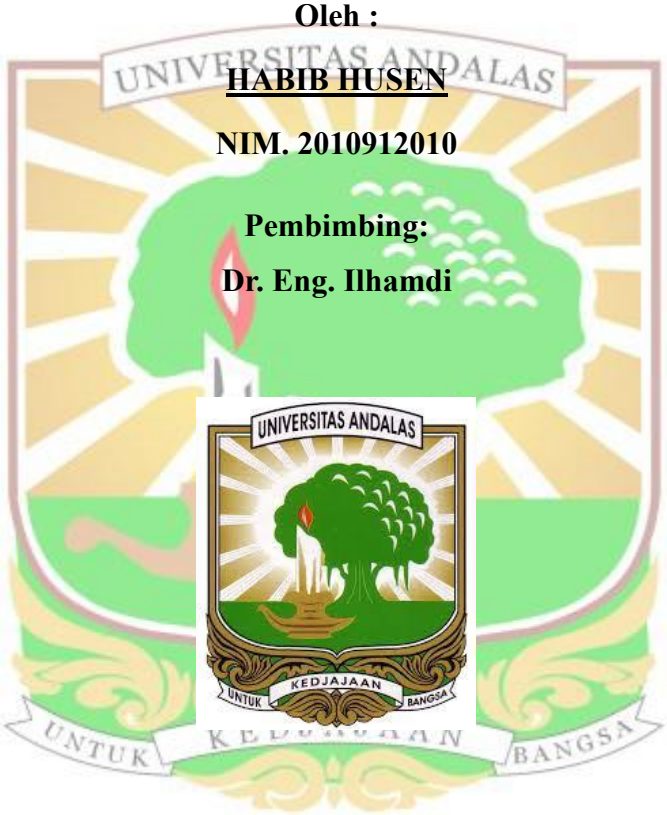

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ABSTRACT

This study investigates the impact of epoxy resin coating on the core of a sandwich structure, specifically Polylactic Acid Plus (PLA+) with Carbon Fiber Reinforced Polymer (CFRP) solid laminate skin. PLA+ was selected as the core material due to its biodegradable nature and ease of production using Fused Deposition Modeling (FDM). However, it is vulnerable to environmental degradation. To address this, a coating treatment was implemented through the dip coating technique to enhance mechanical and environmental resistance. The design of the sandwich structure sought to combine the strength of CFRP and the lightness of PLA+. The research methods employed included 3D printing of PLA+ cores, fabrication of CFRP skins via Vacuum Resin Infusion (VARI), and three-point bending tests according to ASTM C393 standard to evaluate core shear stress, facing stress, flexural modulus, and specific bending load. The results show that the coating effect depends on the core geometry. In geometry 1 (C1), the coating reduced the facing stress by 14.95% (from 39.07 MPa to 33.23 MPa). While in geometry 2 (C2), the coating maintains the facing stress (σ = 52.08 MPa) which is not much different from the specimen without coating (N2). Geometry variation 2 (C2) also has a higher flexural modulus than geometry variation 1 (C1) thanks to a more even stress distribution.

Key Word: 3D printing, three point bending, coating, sandwich composite

ABSTRAK

Penelitian ini menganalisis pengaruh pelapisan (*coating*) resin epoksi pada *core* struktur sandwich composite yaitu *Polylactic Acid Plus* (PLA+) dengan *skin* berupa *Carbon Fiber Reinforced Polymer* (CFRP). PLA+ dipilih sebagai material *core* karena sifatnya yang *biodegradable* dan mudah diproduksi menggunakan *Fused Deposition Modeling* (FDM), namun rentan terhadap degradasi lingkungan, oleh karena itu dilakukan *treatment coating* melalui teknik *dip coating* untuk meningkatkan ketahanan mekanik dan lingkungan. Struktur *sandwich* dirancang untuk menggabungkan kekuatan CFRP dan ringannya PLA+. Metode penelitian meliputi *3D printing core* PLA+, pembuatan *skin* CFRP dengan metode *vacuum assisted resin infusion* (VARI), dan uji lentur (*three point bending*) sesuai standar ASTM C393 untuk mengevaluasi *core shear stress, facing stress, flexural modulus,* dan *specific bending load*. Hasil menunjukkan bahwa efek *coating* bergantung pada geometri *core*. Pada geometri 1 (C1), *coating* mengurangi *facing stress* sebesar 14.95% (dari 39.07 MPa menjadi 33.23 MPa). Sementara pada geometri 2 (C2), *coating* mempertahankan *facing stress* (σ = 52.08 MPa) yang tidak jauh berbeda dari spesimen tanpa *coating* (N2). Variasi geometri 2 (C2) juga memiliki *flexural modulus* yang lebih tinggi dibanding variasi geometri 1 (C1) berkat distribusi tegangan yang lebih merata.

Kata Kunci: *3D printing, three point bending, coating, sandwich composite*