

KARAKTERISTIK MEKANIK KOMPOSIT HIBRIDA SERAT DAUN NANAS DAN E-GLASS SEBAGAI ALTERNATIF LAMBUNG KAPAL LAMBUNG

Mohammad Arbeel Falaah Nazhif

ABSTRAK

Penelitian ini mengevaluasi karakteristik mekanik komposit hibrida *sandwich* serat daun nanas (*Pineapple Leaf Fiber/PALF*) sebagai inti (*core*) dan *E-Glass Fiberglass* sebagai kulit (*skin*) bermatriks epoksi termodifikasi 1 gram *Aerosil*. Perlakuan alkali serat menggunakan larutan NaOH dengan variasi konsentrasi 0%, 5%, 10%, dan 15% (perendaman 2 jam). Spesimen difabrikasi menggunakan metode *hand lay-up* lalu diuji tarik (ASTM D638 Type I) dan lentur (ASTM D7264). Hasil uji tarik menunjukkan kurva berbentuk lonceng, dengan kekuatan tarik maksimum (*Ultimate Tensile Strength/UTS*) tertinggi pada variasi 10% NaOH sebesar 77.33 MPa karena delignifikasi permukaan serat yang optimal. Sebaliknya, variasi 15% NaOH menurunkan UTS hingga 34,00 MPa akibat kerusakan mikrofibril selulosa. Pada uji lentur, kekuatan lentur maksimum (*Ultimate Flexural Strength/UFS*) tertinggi diperoleh pada variasi 0% NaOH (115,00 MPa) karena dominasi kekuatan lapisan luar E-Glass. Berdasarkan regulasi *Rules* Biro Klasifikasi Indonesia (BKI) dengan batas *Rz* minimum 43,12 MPa, hanya variasi 10% NaOH yang dinyatakan layak sebagai material alternatif lambung kapal.

Kata Kunci: Komposit hibrida, serat daun nanas, *E-Glass*, NaOH, BKI.

MECHANICAL CHARACTERISTICS OF PINEAPPLE LEAF FIBER AND E-GLASS HYBRID COMPOSITE AS AN ALTERNATIVE BOAT HULL MATERIAL

Mohammad Arbeel Falaah Nazhif

ABSTRACT

This study evaluates the mechanical characteristics of a hybrid sandwich composite utilizing pineapple leaf fiber (PALF) core and E-Glass fiberglass skin, with an epoxy matrix modified by 1 gram Aerosil. Alkali treatment used NaOH variations of 0%, 5%, 10%, and 15% (2-hour immersion). Specimens were fabricated via hand lay-up and subjected to tensile (ASTM D3039) and flexural (ASTM D7264) tests. Tensile results showed a bell-shaped curve, where the highest Ultimate Tensile Strength (UTS) was achieved by 10% NaOH at 77.33 MPa due to optimal delignification. Conversely, 15% NaOH dropped UTS to 34.00 MPa due to microfibril degradation. In flexural testing, 0% NaOH yielded the highest Ultimate Flexural Strength (UFS) of 115.00 MPa, dominated by the outer E-Glass layers. Based on Bureau Classification of Indonesia (BKI) Rules (minimum R_z 43.12 MPa), only the 10% NaOH composite satisfies safety criteria for alternative boat hulls.

Keywords: Hybrid composite, pineapple leaf fiber, E-Glass, NaOH, mechanical characteristics, BKI.