Studi pengaruh mampu serap air terhadap sifat mekanis dan degradasi kimia pada komposit epoksi e glass di lingkungan nacl 3 5 melalui uji celup = The effect of water absorption on the mechanical properties and chemical degradation of epoxy e glass composite in nacl 3 5 environment through immersion test

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Abstrak

Material FRP (Fiber Reinforced Polymer) diaplikasikan sebagai pipa pada offshore platform dan shipboard piping. Fluida yang mengalir dalam pipa FRP bersifat korosif dengan suhu operasi 75C dan 95C. Material FRP mudah menyerap molekul air yang mengakibatkan penurunan sifat mekanis dan degradasi kimia. Komposit epoksi/E-glass pada penelitian ini diberikan perlakuan melalui uji celup dalam larutan NaCl 3,5% pada suhu 75C dan 95C. Setelah proses perendaman, komposit epoksi/E-glass dilakukan pengujian tarik, SEM dan FTIR. Hasil pengujian tarik menunjukkan tidak ada perubahan sifat mekanis pada epoksi/E-glass setelah proses perendaman. Pengujian SEM menunjukkan adanya microvoid berukuran ±3µm pada epoksi/E-glass yang diperoleh dari proses manufaktur. Seiring dengan peningkatan suhu, terdapat microvoid baru berukuran ±2µm yang disebabkan oleh fibre entanglement pada 75C dan rongga-rongga berukuran ±100µm di dekat serat gelas yang disebabkan oleh pembelahan rantai molekul pada matriks epoksi. Microvoid dan rongga tersebut menyebabkan meningkatnya mampu serap air epoksi/E-glass namun ternyata tidak mempengaruhi sifat mekanis. Perubahan warna larutan NaCl 3,5% dan hasil pengujian FTIR membuktikan adanya degradasi kimia pada epoksi/E-glass setelah proses perendaman pada suhu 75C dan 95C.

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Fiber Reinforced Polymer was applied as a pipe on offshore platforms and shipboard piping. The fluid which flows in that FRP pipe is corrosive with an operating temperature 75C and 95C. FRP material readily absorbs water molecules resulting in a decrease in mechanical properties and chemical degradation. Epoxy/E-glass composite in this study are given treatment by immersion test in 3.5% NaCl solution at temperature 75C and 95C. After immersion, epoxy/E-glass composite is tested by tensile testing, SEM and FTIR. The results of tensile testing showed there is no change in the mechanical properties of epoxy/E-glass after immersion. Photo SEM showed there is microvoid with size ± 3m in epoxy/E-glass that obtained from manufacturing process. As temperature increases, there is new microvoid with size ± 2m caused by fibre entanglement at 75C and many cavities that located near fibre glass with size ± 100m caused by the termination of molecule chain in an epoxy matrix. The microvoid and the cavity is able to cause an increase in water absorption of epoxy/E-glass, but did not affect the mechanical properties. Color change of 3.5% NaCl solution and FTIR testing results prove there is chemical degradation of epoxy/E-glass composite after immersion at temperature 75C and 95C.