

Pengaruh impregnasi Nano SiC dan jumlah lapisan kevlar terhadap ketahanan Balistik Komposit Laminat AA5052 sebagai material armor ringan = The effect of Nano SiC impregnation and jumber of kevlar layers on Ballistic Resistance of Laminated Composite Aluminium AA5052 as lightweight armor materials

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Abstrak

Industri pertahanan nasional khususnya kendaraan tempur membutuhkan adanya pengembangan dari sisi material untuk meningkatkan efektivitas dalam menahan serangan proyektil serta mempermudah mobilitas saat digunakan di medan perang. Pada penelitian ini, digunakan komposit laminat dengan matriks berupa plat aluminium AA5052 dan serat kevlar dengan variasi jumlah lapisan sebanyak 20, 30, dan 40 layer. Kevlar di dalam komposit laminat ini diimpregnasikan dengan campuran nanopartikel SiC (Silikon Karbida) 50nm, ethanol, dan PEG-400 sebagai Shear Thickening Fluid (STF). Plat aluminium dan kevlar direkatkan menggunakan resin epoksi dan hardener dengan metode hand lay-up. Untuk mengetahui ketahanan balistik dan sifat mekanis, dilakukan pengujian balistik level III dan IV yang kemudian dianalisis kedalaman penetrasi proyektil dan diameter perforasi dari komposit laminat. Analisis mikrostruktur dan kandungan unsur dari komposit laminat dilakukan dengan Scanning Electron Microscopy (SEM), Energy Disperse X-Ray Spectrometry (EDS), dan Fourier Transfer Infrared Spectrometry (FTIR). Hasil penelitian menunjukkan adanya pengaruh pada ketahanan balistik dan kekuatan mekanis akibat pengimpregnasian nanopartikel SiC dan variasi jumlah kevlar yang digunakan pada komposit laminat.

.....The national defense industry, especially combat vehicles, requires materials development to increase effectiveness in ballistic resistant and mobility when used on the battlefield. In this study, laminated composites with a matrix of AA5052 aluminum plate and kevlar fiber were used with variations in the number of layers of 20, 30, and 40 layers. The kevlar fabric in this laminated composite was impregnated with a mixture of 50nm SiC (Silicon Carbide) nanoparticles, ethanol, and polyethylene glycol (PEG-400) as Shear Thickening Fluid (STF). The aluminum and kevlar plates are glued together using epoxy resin and hardener by the hand lay-up method. To determine the ballistic resistance and mechanical properties, level III and IV ballistic tests were carried out followed by analyzing the projectile penetration depth and perforation diameter of the laminated composite. Analysis of the microstructure and elemental content of the laminated composites was carried out by Scanning Electron Microscopy (SEM), Energy Disperse X-Ray Spectrometry (EDS), and Fourier Transfer Infrared Spectrometry (FTIR). The results showed that there was an effect on ballistic resistance and mechanical strength due to the impregnation of SiC nanoparticles and variations in the amount of Kevlar used in laminated composites.