# Pengaruh Penambahan Cu Terhadap Respons Pengerasan Penuaan Komposit Al-6Zn-6Si-5MgBerpenguat 10 Vol. % SiC Hasil Squeeze Casting Untuk Aplikasi Balistik = The Effect of Cu Addition on the Age Hardening Response of 10 vol. % SiC Strengthened Al-6Zn-6Si-5Mg Composite Produced by Squeeze Casting for Balllistic Application / Vina Nanda Garjati

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Abstrak

[<b>ABSTRAK</b><br>
Material yang digunakan pada kendaraan balistik harus memiliki kekerasan yang tinggi, namun tidak mengorbankan sifat ketangguhannya.Komposit aluminium berpotensi untuk digunakan sebagai material pengganti bajapada kendaraan balistikkarena ringan dan sifat mekanis aluminium sebagai matriks mampu ditingkatkan dengan penambahan unsur-unsur paduan dan partikel penguat SiC. Selain itu, dapat dilakukan pengerasan penuaan pada komposit aluminium untuk meningkatkan kekuatan.
Penelitian kali ini menggunakan paduan Al-6Zn-6Si-5Mg berpenguat 10 vol. % SiC dengan variasi penambahan 0, 1, dan 3 wt % Cu hasilsqueeze castingyang berbentuk pelat berketebalan 25 mm. Pelat hasil cor kemudiandihomogenisasi pada temperatur 440 °C selama 24 jam untuk menyeragamkan butir. Selanjutnya dilakukan laku pelarutan dan pengerasan penuaan terhadap pelat komposit ini pada temperatur 200 °C.Karakterisasi komposit aluminium berpenguat SiC tersebut meliputi pengujian kekerasan untuk membuat kurva penuaan, pengujian impak, pengamatan struktur makro dan mikro dengan mikroskop optik dan SEM, serta pengujian balistik tipe III berkaliber 7.62 mm.
Hasil penelitian ini menunjukkan bahwa penambahan kandungan Cu menyebabkan peningkatan kekerasan pada kondisi as-cast. Penambahan Cu tidak memberi pengaruh terhadap respons pengerasan penuaan, disebabkan oleh tingginya kadar Zn, Mg, dan Si pada paduan ini. Penambahan kandungan Cu sebesar 0, 1 dan 3 wt.% menghasilkan kekerasanpuncak senilai 49.94, 52.92 dan 54.89 HRB berturut-turut selama 4 jam pada temperatur penuaan 200 °C. Penambahan kandungan Cu dari 0, 1 dan 3 wt.%menghasilkan harga impak 18.7 x 10-3, 26.6 x 10-3, dan 25.5 x 10-3J/mm2. Hasil pengujian balistik menunjukkan bahwa semua pelat komposit belum mampu menahan penetrasi peluru pada pengujian balistik tipe III.
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<b>ABSTRACT</b><br>
Ballistic application requires materials with high strength and good toughness. Aluminium composite materials is potential to subsitute steel as a material for ballistic vehicle due to its light weight and improved properties by addition of alloying elements and SiC reinforced particles. Age hardening can also applied to this material to improve its properties.
This research studied Al-6Zn-6Si-5Mgreinforced by 10 vol. %SiC with varied content of 0, 1, and 3 wt % Cu with 25 mm thickness produced bysqueeze casting. The composite was homogenized at 440 °C for 24 hours, followed by solution treatment at 460 °C for 1 hour and then aged at 200 °C. The characterization included hardness testing to construct the ageing curve, impact testing, microstructure observation by using optical microscope and SEM, as well astype III ballistic testing.

The results showed that the addition of Cu increased hardness in as-cast condition. However, addition of Cu did not give any increased response to age hardening due to high content of Zn, Mg, and Si. The peak hardness of 0, 1 and 3 wt. % Cu added composites was 49.94, 52.92 and 54.89 HRB, respectively, achieved after 4 hours at 200 °C. Impact strength decreased with the addition of Cu. Type III ballistic testing type III results showed that all plates could not stop the bullets penetration, Ballistic application requires materials with high strength and good toughness. Aluminium composite materials is potential to subsitute steel as a material for ballistic vehicle due to its light weight and improved properties by addition of alloying elements and SiC reinforced particles. Age hardening can also applied to this material to improve its properties.
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