Pengembangan Material Komposit ADC12/B4C dengan Variasi Komposisi Penguat Boron Karbida Melalui Metode Stir Casting Sebagai Material Kampas Rem pada Kereta Api = Development of ADC 12/B4C Composite with Various Boron Carbide Reinforcement Composition Through Stir Casting Method for Railways Brake Shoe

Mahendra Ammar Pratama, author

Abstrak

ABSTRAK
Penggunaan kampas rem kereta api konvensional menggunakan material besi tuang kelabu sejatinya masih memiliki kekurangan seiring terdapat konsentrasi tegangan yang tinggi sehingga dapat mengganggu fungsi pengereman. Komposit aluminium menjadi salah satu material yang menjanjikan untuk dijadikan kampas rem kereta api karena memiliki densitas yang rendah serta kombinasi sifat kekuatan dan ketahanan aus yang baik. Dalam penelitian ini, dilakukan fabrikasi komposit Aluminium ADC12 berpenguat boron karbida dengan variasi penambahan penguat sebesar 1, 3, 5, 7, dan 10 % fraksi volum melalui pengecoran aduk. Magnesium sebagai agen pembasahan, Titanium-boron sebagai penghalus butir, dan stronsium sebagai modifier ditambahkan untuk meningkatkan sifat mekanisnya. Karakterisasi material komposit ADC12/B4C dilakukan dengan melakukan analisis metalografi Optical Microscope (OM), Scanning Electron Microscope (SEM), X-Ray Difraction (XRD), dan Optical Emission Spectometry (OES) serta pengujian mekanik seperti tarik, kekerasan, impak, dan keausan. Diperoleh komposisi optimum material komposit ADC12/B4C pada variasi penambahan penguat 7% fraksi volum dengan nilai kekuatan tarik 231.117 MPa, kekerasan 58.34 HRB, ketahanan impak 0.09375 J/mm2, dan laju aus 0.00326 x 10-5 mm/m3. Beberapa fasa yang terbentuk pada material komposit diantaranya Mg2Si, Al2Cu, dan -Al5FeSi.
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ABSTRACT
Conventional railway brakeshoe using gray cast iron material actually still has disadvantages as there is a high stress concentration that can interfere with the braking function. Aluminum composite is one of the promising materials for railway brakeshoe because it has a low density and good combination of strength and wear resistance. In this study, the fabrication of Aluminium ADC12 composites reinforced by boron carbide was carried out with variations in the addition of reinforcement of 1, 3, 5, 7, and 10% volume fractions through stir casting. Magnesium as a wetting agent, Titanium-boron as a grain refiner, and strontium as a modifier added to improve its mechanical properties. Characterization of composite materials ADC12/B4C was carried out by performing metallographic analysis of Optical Microscope (OM), Scanning Electron Microscope (SEM), X-Ray Difraction (XRD), and Optical Emission Spectometry (OES) as well as mechanical tests such as tensile, hardness, impact, and wear. The optimum composition of the composite material was obtained ADC12/B4C with the addition of 7% volume fraction reinforcment with a tensile strength value of 231.117 MPa, hardness of 58.34 HRB, impact resistance 0.09375 J/mm2, and wear rate 0.00326 x 10-5 mm/m3. Some phases formed in composite materials include Mg2Si, Al2Cu, and -Al5FeSi.