World Academy of Science, Engineering and Technology
International Journal of Mechanical and Industrial Engineering
Vol:10, No:10, 2016

Application of Recycled Tungsten Carbide Powder for Fabrication of Iron Based Powder Metallurgy Alloy

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Abstract : Tungsten carbide is widely used as a tool material in metal manufacturing process. Since tungsten is typical rare metal, establishment of recycle process of tungsten carbide tools and restore into cemented carbide material bring great impact to metal manufacturing industry. Recently, recycle process of tungsten carbide has been developed and established gradually. However, the demands for quality of cemented carbide tool are quite severe because hardness, toughness, anti-wear ability, heat resistance, fatigue strength and so on should be guaranteed for precision machining and tool life. Currently, it is hard to restore the recycled tungsten carbide powder entirely as raw material for new processed cemented carbide tool. In this study, to suggest positive use of recycled tungsten carbide powder, we have tried to fabricate a carbon based sintered steel which shows reinforced mechanical properties with recycled tungsten carbide powder. We have made set of newly designed sintered steels. Compression test of sintered specimen in density ratio of 0.85 (which means 15% porosity inside) has been conducted. As results, at least 1.7 times higher in nominal strength in the amount of 7.0 wt.% was shown in recycled WC powder. The strength reached to over 600 MPa for the Fe-WC-Co-Cu sintered alloy. Wear test has been conducted by using ball-on-disk type friction tester using 5 mm diameter ball with normal force of 2 N in the dry conditions. Wear amount after 1,000 m running distance shows that about 1.5 times longer life was shown in designed sintered alloy. Since results of tensile test showed that same tendency in previous testing, it is concluded that designed sintered alloy can be used for several mechanical parts with special strength and anti-wear ability in relatively low cost due to recycled tungsten carbide powder.

Keywords : tungsten carbide, recycle process, compression test, powder metallurgy, anti-wear ability
Conference Title : ICMEDA 2016 : International Conference on Mechanical Engineering Design and Analysis
Conference Location : Osaka, Japan
Conference Dates : October 10-11, 2016