

Experimental Study of Al₂O₃ and SiC Nano Particles on Tensile Strength of Al 1100 Sheet Produced by Accumulative Press Bonding Process

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Abstract : The SPD process widely used to optimize microstructure, strength and mechanical properties of the metals. Processes such as ARB and APB could have a considerable impact on improving the properties of metals. The aluminum material after steel, known as the most used metal, Because of its low strength, there are restrictions on the use of this metal, it is required to spread further studies to increase strength and improve the mechanical properties of this light weight metal. In this study, Annealed aluminum material, with yield strength of 85 MPa and tensile strength of 124 MPa, sliced into 2 sheets with dimensions of 30 and 25 mm and the thickness of 1.5 mm. then the sheets press bonded under 6 cycles, which increased the ultimate strength to 281 MPa. In addition, by adding 0.1%Wt of SiC particles to interface of the sheets, the sheets press bonded by 6 cycles to achieve a homogeneous composite. The same operation using Al₂O₃ particles and a mixture of SiC+Al₂O₃ particles was repeated and the amount of strength and elongation of produced composites compared with each other and with pure 6 cycle press bonded Aluminum. The results indicated that the ultimate strength of Al/SiC composite was 2.6 times greater than Annealed aluminum. And Al/Al₂O₃ and Al/Al₂O₃+SiC samples were low strength than Al/SiC sample. The pure 6 time press bonded Aluminum had lowest strength by 2.2 times greater than annealed aluminum. Strength of aluminum was increased by making the metal matrix composite. Also, it was found that the hardness of pure Aluminum increased 1.7 times after 6 cycles of APB process, hardness of the composite samples improved further, so that, the hardness of Al/SiC increased up to 2.51 times greater than annealed aluminum.

Keywords : APB, nano composite, nano particles, severe plastic deformation

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