

Metal bonding by Friction-Assisted Lateral Extrusion Process (FALEP) at room temperature

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The Friction-Assisted Lateral Extrusion (FALEP) is an SPD process [1] which can apply extremely large shear strain to a bulk or powder metal, in a single step, to obtain ultra-fine-grained sheet metal. In the present work, FALEP is applied for metal bonding of different layers of aluminum alloys at room temperature (examples shown in Fig. 1). Because of the excellent bonding capacity, FALEP can be used as a semi-continuous process producing sheet with unlimited length. The good bonding capacity is due to the huge increase by shear strain between the initial contact surfaces during a single step (in the order of 10 times). Therefore, it is expected that FALEP - when used in several cycles - can become a strong competitor to the well-known ARB (accumulative roll bonding) process, where the increase in the surface contact in one cycle is only a factor of 2. The cyclic FALEP process can be called 'ASB': accumulative shear bonding.

Keywords: FALEP, SPD, metal bonding, accumulative roll bonding, accumulative shear bonding

Reference

[1] Vu, VQ, Toth, LS, Beygelzimer, Y, Zhao, Microstructure, Texture and Mechanical Properties in Aluminum Produced by Friction-Assisted Lateral Extrusion, MATERIALS, 14 (2021) DOI 10.3390/ma14092465

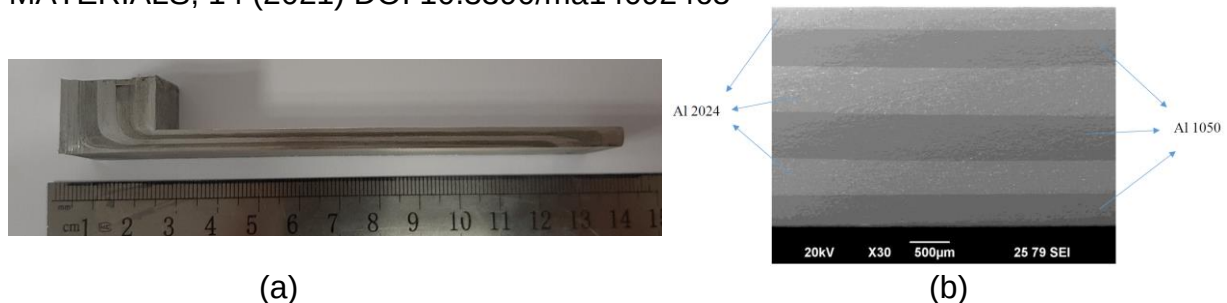


Fig. 1.

Metal bonding by FALEP (a): Al5052-Al1050, (b): Al2024-Al1050 (SEM image).