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| **Abstract:** |  |
| In order to make micro composite drills (Fig. 1), cemented tungsten carbide (WC-10Co) and high strength (AISI 4340) steel were successfully bonded by hot compaction diffusion bonding at a low temperature. The effects of holding time, pressure and temperature on microstructure and mechanical properties of the sintered carbides and bonding strengths of the bimetallic composites were examined, and a transitional layer was found at the interface as a result of elemental inter-diffusion. The optimal bonding parameters were determined to achieve the maximum bonding strength of 226 MPa of the WC-10Co/AISI 4340 steel joints, which is helpful in producing micro composite drills. Microforming is introduced to produce lighter and more energy effective products. In this study, Magnesium-Lithium (Mg-Li) alloy, new material in microscale, was chosen to superior formed micro-cup due to its ultralight weight with outstanding ductility. The dry and oil lubrication conditions were chosen as benchmarks to investigate effects of a novel oil-based nano-particle lubricant in micro deep drawing (MDD) process of Mg-Li alloy. Finite Element (FE) modelling was conducted and the simulation results of the drawing force were in a good agreement with the experimental results. The formed cup quality with consideration on the surface roughness has been extensively evaluated and the results illustrated the quality improvement was substantial. | |