DEEP DRAWABILITY OF METAL COMPOSITE SANDWICH PLATES

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Abstract: The deep drawing behavior of metal-composite sandwich plates in which aluminum sheets are used as the face layer and composite materials are used as the core layer, is discussed in this work to find the workpieces without fractures and wrinkles. Two types of aluminum, 1050 and 6061, are considered their suitability as face sheets. The preheat effect of aluminum 6061 on formability is also investigated. When steel sheets are used, the effect of blankholder pressure is included. For Al-composite sandwich plates, fractures and wrinkles are easy to occur. Even though the fracture and wrinkle conditions are released with the increase in preheating temperature of aluminum 6061, it may be not enough.

2. Materials and Methods

The first type of metal-composite sandwich used aluminum with a thickness of 0.5 mm as the face sheet and the same composite material with [(0/90)] as the core layer having 2-mm-thickness. Two types of aluminum, 1050 and 6061, were selected because of their availability. The total thickness of the sandwich was 3 mm. By applying Bechem lubricant between the metal and the mold, these two types of Al-composite sandwiches were deep drawn at room temperature with the blank-holder pressure of 0.6 MPa.

3. Key Results

The deep drawing of these two types of Al Al-composite sandwich laminate is shown in figures 1 and 2. The fracture condition of the Al 1050 sandwich is much worse than that of the Al 6061 sandwich, and this may be due to the yield and ultimate strengths of Al 1050 being less than those of Al 6061. According to the condition of fracture and wrinkle in figures 1 and 2, one may find that it may be difficult to obtain a good quantity workpiece by using these piece two types of aluminum face sheets.

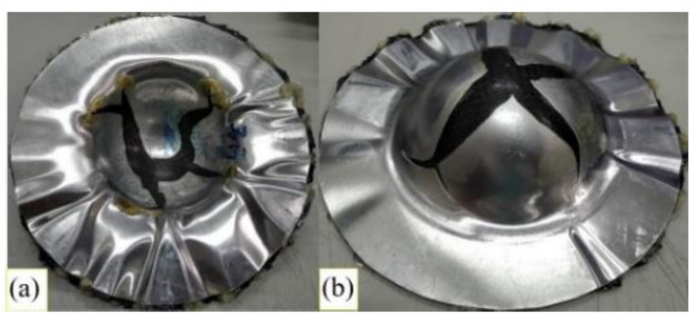

Figure 1: Deep drawing of Al 1050-composite sandwich: (a) front view, (b) back view.

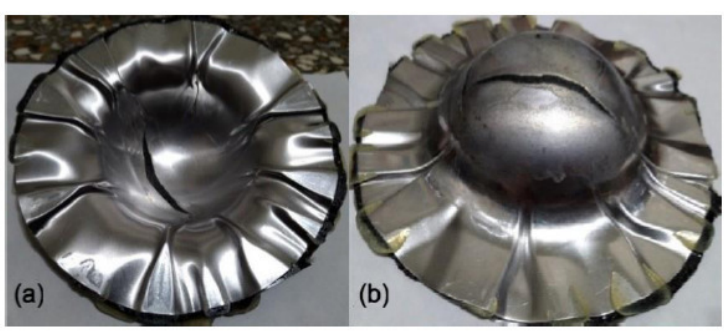

Figure 2: Deep drawing of Al 6061-composite sandwich: (a) front view, (b) back view.

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