Trials to Evaluate Bulging Formability of Duplex Embossed A1050-O Sheet Using Erichsen Test

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Abstract. The duplex embossing process is more and more prevalent in the automotive and architecture industry. The cross-sectional shape will be changed to wave shape after subjected to this technique, hence, the bending rigidity will be enhanced because the secondary moment of area increased which have been confirmed that embossing process has potential for producing a quasi-uniform sheet which has a moderate tensile rigidity and high bending rigidity [1]. Moreover, the duplex embossed sheet also used for functional reasons due to it exhibits some good abilities of compensating energy absorption, thermal insulation and sound insulation of plain sheet. Therefore, it is possible for such a sheet to realize good mechanical, lightweight and multi-functionality at the same time. It has been confirmed that the mechanical properties of plain sheets depend on aggregate structure derived from the rolling process. After subjected to embossing process, a periodic convex-concave structure will be planted. Therefore, a new apparent mechanical property will be shown, which depends on both microscopic and sub-macroscopic structures [2].

As the embossed sheets applied more and more widely. It is considered that the deformation behavior is also important for engineers especially in press workshops. However, variation of the apparent formability of embossed sheets has not been reported intensively. In this present study, the Erichsen test was attempted to conduct used embossed A1050-O sheets. Through comparing the punch stroke when fracture was occurred, the bulging formability of embossed sheet was evaluated. Moreover, through observing the fracture behavior of embossed sheets and plain sheet, the effect of this sub-macroscopic structure on fracture behavior and this new anisotropy was also discussed. It is considered to be a good experiment basis to establish a material model with periodic embossing structure for FEM analysis to evaluate the embossing formability in the next stage.

References

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