The numerical failure prediction by the damage model GISSMO in various materials of sheet metal

Shota Chinzei[1], Junya Naito[2]

[1,2] KOBE STEEL, LTD., Multi-Material Structural Design and Joining Research Section Mechanical Engineering Research Laboratory Technical Development Group, 1-5-5, Takatsukadai, Nshi-ku, Kobe, HYOGO, 651-2271 JAPAN,

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【Abstract】

Responding to continuous demands for weight saving and enhancement of collision safety of vehicles, high-strength steel sheets are widely used for car bodies. Also, the applications of aluminum sheets are increasing for seeking more lightweight, recently. In applying sheet metals with thinner thickness and higher strength to car bodies, numerical failure predictions are strongly required to ensure collision safety, since the reduction of ductility becomes key issue for these materials.

Various failure models for failure prediction of sheet material in car body collision are proposed, and model considering the failure criterion depending on stress triaxiality is one of the most leading ones. For instance, the damage model GISSMO (Generalized Incremental Stress-State dependent damage MOdel) has been developed by Daimler and DYNAmore, which includes incremental formulation for the description of material instability and localization.

In this study, failure curves for GISSMO are identified by experimental data on several sheet materials, namely, PHS (TS 1500MPa grade), UHSS (TS 980MPa grade), aluminum alloy 7000 series. Numerical failure prediction using GISSMO is conducted for the quasi-static axial crush test of HAT member. We discuss the validity of the damage model GISSMO for high strength steel and aluminum alloy sheets by comparing experimental and numerical results.