International Seminar on Material Modeling of High Strength Steel Sheets

【開催日】 2020 年 1 月 16 日(木)15:00～16:30

【開催場所】東京農工大学 小金井キャンパス 6 号館 5 階 501 セミナー室(電話 (042) 388-7083)
http://www.tuat.ac.jp/outline/overview/access/koganei/campus_map/

【共催】東京農工大学 グローバルイノベーション研究機構(GIR)／ 日本塑性加工学会 板材成形分科会

【趣旨】成形シミュレーションの高精度化への要求とともに材料モデルの高度化研究もますます発展しています. 本セミナーでは, 高張力鋼板の材料モデリングとプレス成形への適用事例に関する最新の研究成果を紹介します. 高次異方性降伏関数で世界的に有名な POSTEC の Barlat 教授からは, 2011 年に発表された HAH モデルの最新改良版モデル(HHAH20)に関してご発表頂きます. 本モデルはひずみ経路の変化に伴うバウシンガ効果や公差効果が再現可能です(本邦初公開). ユニプレスの乃万博士からは, 高張力鋼板の引張圧縮非対称性(SD 効果)を再現する材料モデルとそのスプリングバック解析への適用事例について講演頂きます.

【参加費】 講演会:無料, 技術懇談会:無料

【参加申込方法】参加ご希望の方は, 御所属・御氏名・懇談会参加の有無を桑原(kuwabara@cc.tuat.ac.jp)までメールにて御一報下さい. (1/14(火)までにお願いします)

【プログラム】

15:00-15:10 Opening remarks **Toshihiko Kuwabara, Tokyo Univ. Agriculture & Technology**

15:10-16:00

HAH_{20} DISTORTIONAL PLASTICITY FRAMEWORK INCLUDING PRESSURE EFFECT

Frédéric Barlat,
Graduate Institute of Ferrous Technology, Pohang University of Science and Technology

A distortional plasticity framework describing the anisotropic hardening effects that occur during strain path changes, such as the Bauschinger and cross-loading effects, is developed. This approach, called HAH_{20}, is a modified version of the homogeneous anisotropic hardening (HAH) framework proposed almost a decade ago (Barlat et al., 2011, Int. J. Plast. 27, 1309–1327). Like the HAH approach, HAH_{20} does not include any form of kinematic hardening. In the present formulation, the HAH_{20} yield condition provides an alternative description of the distortion suggested by crystal plasticity simulation results (Jeong et al., 2017, Int. J. Plast. 93, 212-228). In addition, it incorporates the influence of the hydrostatic pressure, which manifests itself by a higher flow stress in uniaxial compression compared to tension. The state variable evolutions in HAH_{20} are modified compared to the previous HAH version for a smoother transition between pure cross-loading cases and pure reversals. The model is calibrated for a DP780 dual-phase steel sheet sample using the data of a tension-compression test with three full cycles, as well as a sequence of two uniaxial tension segments in different directions. After calibration, the stress-strain curves predicted for independent loading sequences are compared with experimental results. Finally, theoretical predictions using the constitutive coefficients of DP780 are discussed in view of the features offered by this new framework.

16:00-16:30

PRACTICAL USAGE OF ADVANCED MATERIAL MODELS FOR PRESS FORMING SIMULATION IN AUTOMOTIVE INDUSTRY

Nobuyasu Noma
UNIPRERS R&D CO., LTD.

Stamping manufactures are required to complete the die modification quickly to gain a cost advantage in vehicle development. However, dramatic increase of strength of steels for automotive stamping parts raise the difficulty of die modification. To reduce the die modification cost and time, virtual design and modification using FEM simulation is a key technique. Naturally, to enhance the accuracy of FEM simulation, accurate material model is very important. In UNIPRESS, crush forming without blank holding is a major processing method due to the strength of steels. In this processing, twisting and wall opening, which are different types of springback, are severe problem. To predict those defects accurately, both the SD effect and the unloading behavior after pre-strain were investigated. We concluded that the consideration of the SD effect is effective for twist prediction as well as wall opening prediction. Modeling method of unloading behavior is also crucial because the amount of springback is greatly affected by the Young's modulus and the stress at the bottom dead center. In this presentation, summary of those results and practical usage of advanced material models used in UNIPRES are introduced.