Flow Analysis of Long-Fiber-Reinforced Thermoplastic in Injection Molding

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Verton

Synopsis :

Flow analysis of long-fiber-reinforced polypropylene　PP-Verton　 in injection molding was carried out to predict the weld line location, the orientation distribution of fibers and the anisotropic material properties based on the fiber orientation. The predicted results were in good agreement with the experimental data of real molded parts. It was confirmed that the commercially-available flow analysis program could be successfully applied to the above-mentioned analysis of long-fiber-reinforced resin. A bending test of the molded part was carried out along with the FEM simulation of the bending test in which the anisotropic material properties obtained by flow analysis were employed. The load-deflection curve obtained by the simulation was in good agreement with the measured one.

長繊維強化樹脂射出成形の流動解析*

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要旨

90 mm 60 mm

Support position
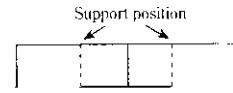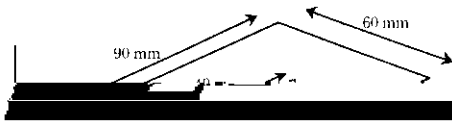
圧縮性、非ニュートン純粘性を仮定して導かれる、式 (1)～(5) の基礎方程式にしたがい計算が行なわれる。

運動方程式：

$$(\partial p/\partial x) = (\partial \tau_{zx}/\partial z) \quad\cdots\cdots\cdots\cdots\cdots\cdots\cdots (1a)$$

$$(\partial p/\partial y) = (\partial \tau_{zy}/\partial z) \quad\cdots\cdots\cdots\cdots\cdots\cdots\cdots (1b)$$

連続の式：

$$(\partial \rho/\partial t) + (\partial \rho u/\partial x) + (\partial \rho v/\partial y) = 0 \cdots\cdots\cdots\cdots\cdots (2)$$

構成方程式：

$$\tau_{zx} = \eta \dot{\gamma}_{zx} \quad\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots (3a)$$

$$\tau_{zy} = \eta \dot{\gamma}_{zy} \quad\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots (3b)$$

エネルギー方程式：

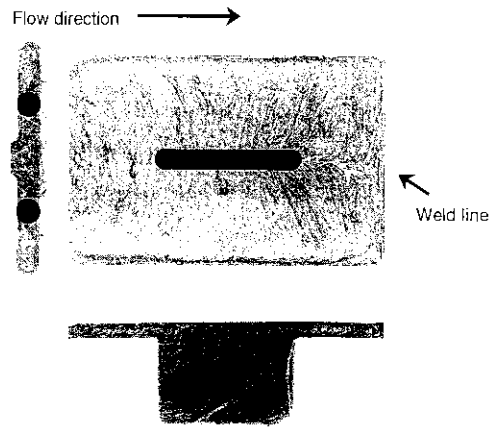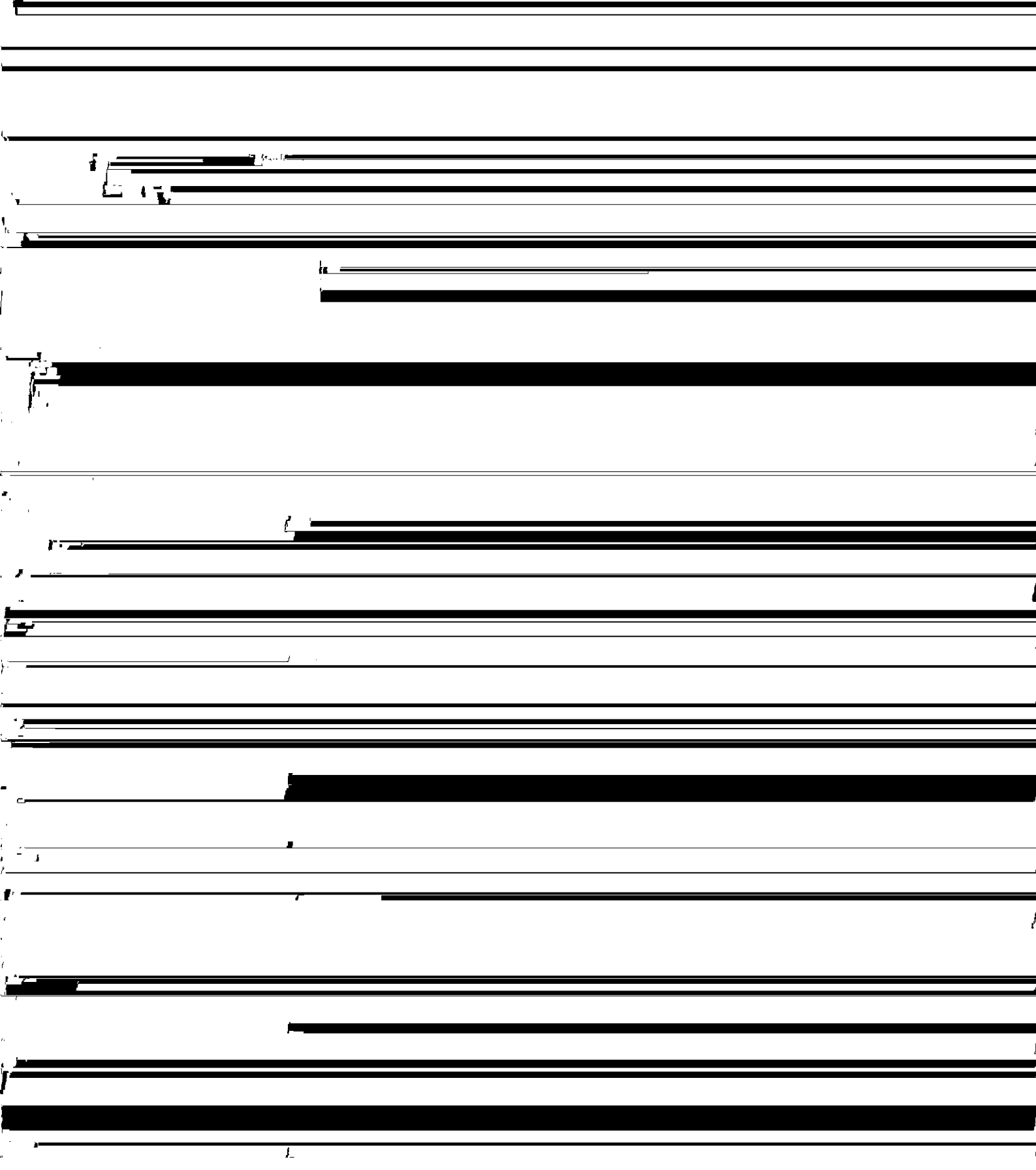$$\rho C_p \{(\partial T/\partial t) + u(\partial T/\partial x) + v(\partial T/\partial y)\}$$

Photo 1　Soft X-ray photographs (T5H25)

$$(p + \hat{p})(\rho^{-1} - \hat{\rho}^{-1}) = \hat{R}T \quad\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots (5)$$

(a) Position 1

(b) Position 2

0.15

0.15

25
- - - - Measured
- - - - Calculated