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Tip-clearance Effect on Mixing Performance of Twin Screw Extruders

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In order to evaluate the tip-clearance effect on mixing, 3-D numerical simulations were applied to kneading block section of co-rotating twin screw extruders. The software we used was originally developed non-Newtonian and non-isothermal flow analysis based on FEM technique. The marker-particle tracking analysis was also developed in order to estimate the particle path, residence time distribution, stress and strain history, and so on.
The stress distribution obtained by the above-mentioned simulations suggested the following mixing mechanisms. The kneading block with small tip-clearance caused high and broad stress distribution. On the other hand, the large tip-clearance caused low and narrow stress distribution. In other words, the former caused strong and heterogeneous stress induced mixing, dispersive mixing, and the latter caused weak and homogeneous dispersive mixing. Since the tip-clearance applied significant effect to the dispersive mixing, it should be optimised in accordance with the material design.