Fluid flow in a rotating cylindrical container with a rotating disk at the fluid surface

Takaji Inamuro

Department of Chemical Engineering, Graduate School of Engineering, Kyoto University, Yoshida-honmachi, Sakyu-kuKyoto 606-01JapanJPN

Akimasa Yamaguchi

Department of Chemical Engineering, Graduate School of Engineering, Kyoto University, Yoshida-honmachi, Sakyu-kuKyoto 606-01JapanJPN

Fumimaru Ogino

Department of Chemical Engineering, Graduate School of Engineering, Kyoto University, Yoshida-honmachi, Sakyu-kuKyoto 606-01JapanJPN

Received 11-SEP-96

Fluid flow in a rotating cylindrical container of radius Rw and height H with a co-axially rotating disk of radius Rd at the fluid surface is numerically investigated. The container and the disk rotate with angular velocities Ωw and Ωd, respectively. We solve the axisymmetric Navier–Stokes equations using a finite-volume method. The effects of the relative directions and magnitudes of the disk and container rotations are studied. The calculations are carried out with various ratios of Ωw and Ωd for H/Rw=2 and Rd/Rw=0.7. Streamlines and velocity vectors in the meridional plane and azimuthal velocities are obtained. The flow fields in the meridional plane are discussed with relation to azimuthal velocities in the interior of the container. The numerical results are also compared with experimental data.

Rotating flowRotating disk and containerCzochralski crystal-growth processFinite-volume methodNumerical simulation

Copyright (c) 1998 Elsevier Science B.V. All rights reserved.