ONLINE ISSN : 1880-1986
PRINT ISSN : 1346-8235

Journal of Textile Engineering
Vol. 54 (2008) , No. 4 111-119

[PDF (1083K)] [References]

Effective Thermal Conductivity of Plain Weave Fabric and its Composite Material Made from High Strength Fibers

Yoshihiro YAMASHITA[1)], Hiroaki YAMADA[1)] and Hajime MIYAKE[2)]

1) Department of Materials Science, The University of Shiga Prefecture
2) North Eastern Industrial Research Center of Shiga Prefecture

(Received September 25, 2007)
(Accepted for publication July 30, 2008)

Abstract: Structural models of yarn, plain weave fabrics, and plain weave fabric/resin composites were derived and theoretical formulas for the effective thermal conductivity were developed from these models. First the effective thermal conductivity of the transverse direction of the yarn was obtained by using the effective thermal conductivity of the fiber. Then the effective thermal conductivity in the direction of the thickness of both plain weave fabrics and composite materials was calculated from the yarn thermal conductivity. Also, we analyzed heat flow in plain weave fabrics using the finite element method. Heat flows not only in the direction transverse to the yarn, but also in the parallel direction, however heat flow in the direction of the thickness of the plain weave fabric became only twice that calculated by assuming that heat does not flow in the direction parallel to of the yarn at all. We confirmed that the heat conduction anisotropy of fibers must be considered when designing the effective thermal conductivity of plain weave fabrics and of plain weave fabric/resin composites.

Key Words: Effective thermal conductivity, High strength fiber, Composite, CAE analysis, Transverse heat flow

[PDF (1083K)] [References]

Download Meta of Article[Help]
RIS