

Variable fluid properties and thermal radiation effects on flow and heat transfer in micropolar fluid film past moving permeable infinite flat plate with slip velocity*

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Abstract This work deals with the influence of thermal radiation on the problem of the mixed convection thin film flow and heat transfer of a micropolar fluid past a moving infinite vertical porous flat plate with a slip velocity. The fluid viscosity and the thermal conductivity are assumed to be the functions of temperature. The equations governing the flow are solved numerically by the Chebyshev spectral method for some representative value of various parameters. In comparison with the previously published work, the excellent agreement is shown. The effects of various parameters on the velocity, the microrotation velocity, and the temperature profiles, as well as the skin-friction coefficient and the Nusselt number, are plotted and discussed.

Key words micropolar fluid, thin film, slip velocity, variable fluid properties, thermal radiation, Chebyshev spectral method

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Nomenclature

c_p ,	specific heat at constant pressures;	Nu ,	Nusselt number;
C_f ,	skin-friction coefficient;	p ,	pressure;
$\underline{E}$,	body force per unit mass;	Pr ,	Prandtl number;
f_w ,	dimensionless suction or injection velocity;	Q ,	internal heat generation density;
g ,	gravitational acceleration acting in the downward direction;	q_r ,	radiation heat flux;
$g(\eta)$,	dimensionless microrotation;	q_w ,	heat transfer from the plate;
J ,	microinertia;	R ,	radiation parameter;
k ,	gyroviscosity;	Re ,	Reynolds number;
K ,	material parameter;	T ,	fluid temperature;
k^* ,	mean absorption coefficient;	T_0 ,	temperature on the free surface;
$\underline{L}$,	body couple per unit mass;	T_w ,	surface temperature of the plate;
m_1 ,	buoyancy parameter;	U, V ,	dimensional components of the velocities along and perpendicular to the plate, respectively;
n ,	boundary parameter;	U_w ,	surface velocity;
N ,	dimensional component of microrotation vector normal to the XY-plane;	u ,	dimensionless velocity along the plate;
		$\underline{U}$,	translational vector;

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