The Analysis Approach of Boundary Layer Equations of Power-Law Fluids of Second Grade

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A powerful analytic technique for nonlinear problems, the homotopy analysis method (HAM), is employed to give analytic solutions of power-law fluids of second grade. For the so-called second-order power-law fluids, the explicit analytic solutions are given by recursive formulas with constant coefficients. Also, for the real power-law index in a quite large range an analytic approach is proposed. It is demonstrated that the approximate solution agrees well with the finite difference solution. This provides further evidence that the homotopy analysis method is a powerful tool for finding excellent approximations to nonlinear equations of the power-law fluids of second grade.

Key words: Power-Law Fluid of Second Grade; Boundary Layers; Similarity Transformations; Homotopy Analysis Method; Series Solutions.