

Chang, Tong-Bou; Mehmood, A.; Bég, O. Anwar; Narahari, M.; Islam, M. N.; Ameen, F.
Numerical study of transient free convective mass transfer in a Walters-B viscoelastic flow with wall suction. (English) [Zbl 1221.76028](#)
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Summary: A transient model for the free convective, nonlinear, steady, laminar flow and mass transfer in a viscoelastic fluid from a vertical porous plate is presented. The Walters-B liquid model is employed which introduces supplementary terms into the momentum conservation equation. The transformed conservation equations are solved using the finite difference method (FDM). The influence of viscoelasticity parameter (Γ), species Grashof number (Gc), Schmidt number (Sc), distance (Y) and time (t) on the velocity (U) and also concentration distribution (C) is studied graphically. Velocity is found to increase with a rise in viscoelasticity parameter (Γ) with both time and distances close to the plate surface. An increase in Schmidt number is observed to significantly decrease both velocity and concentration in time and also with separation from the plate. Increasing species Grashof number boosts the flow velocity through all time and causes a significant rise primarily near the plate surface. The study has applications in polymer materials processing.

MSC:

[76A10](#) Viscoelastic fluids
[76R10](#) Free convection

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Keywords:

[transient viscoelastic flow](#); [Walters-B short-memory model](#); [numerical solution](#); [mass transfer](#); [Schmidt number](#); [Grashof number](#); [polymer processing](#)

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