International J. of Math. Sci. & Engg. Appls. (IJMSEA) ISSN 0973-9424, Vol. 4 No. III (August, 2010), pp. 355-367

THE INSTABILITY OF STREAMING WALTERS'(MODEL B0) FLUIDS IN POROUS MEDIUM

SANJEEV KUMAR, DEEPAK GUPTA AND RENU JASWAL

Abstract

The influence of medium porosity and viscoelasticity on the stability of a streaming elasticoviscous fluid is examined for viscoelastic polymeric solutions in the presence and absence of surface tension. These solutions are known as Walters'(model B0) fluids and their rheology is approximated by the Walters' (model B0) constitutive relations, proposed by Walters [23]. The configuration is taken to be bottom-heavy. In the absence of surface tension, the perturbations transverse to the direction of streaming are found to be unaffected by the presence of streaming if perturbations in the direction of streaming are ignored, whereas for perturbations in all other directions, their exists the instability for a certain wave number range. The surface tension is able to suppress this Kelvin-Helmoltz instability for small wave length perturbations, and the medium porosity and the viscoelasticity reduce the stability range given in terms of a difference in streaming velocities. For the top heavy configurations, the surface tension stabilizes a certain wave number range.

2000 Mathematics Subject Classification: 76A10, 76S05.

@ Ascent Publication House: http:// www.ascent-journals.com

Key Words : Walters' (model B0) uid, Medium porosity, Surface tension, Viscosity, Viscoelasticity.