EFFECT OF VISCOSITY AND SURFACE TENSION ON THE
GROWTH OF MAGNETO RAYLEIGH-TAYLOR INSTABILITY
INDUCED BY LASER AT TWO FLUID INTERFACE

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Two fluid interface may be unstable under a constant force or gravity or
impingement of a shock at the interface. Nonlinear structures like bubble will be
formed by lighter fluid inside heavier fluid where as spike will be made of heavier
fluid inside the lighter fluid under different conditions. Motion of these structures can
be controlled by certain physical conditions in laser matter interaction like Inertial
Confinement Fusion (ICF). In this paper we derived a set of nonlinear equation using
potential flow model to explain the motion of the nonlinear interfacial structures
(bubble/spike) induced by high power laser in presence of transverse magnetic field
on two viscous fluids. Here, the wave vector is assumed to lie in interface and
perpendicular to the magnetic field and shock impingement direction. There will be
no effect of magnetic field as mentioned by Chandrasekhar[1] in classical theory.
However, in nonlinear case, Rayleigh-Taylor instability can stabilize/destabilize or
can show nonlinear oscillation in presence of magnetic field depending on the action
of hydrodynamic and magnetic pressure [2]. Magnetic field and viscosity both have a
stabilizing effect on growth rate of Rayleigh-Taylor instability (RTI). However,
viscosity has damping oscillation effect and damping factor increases with increasing
of kinematic viscosity of heavier fluid through which bubble rises. The oscillation of
the interface can be controlled by viscosity of fluids and magnetic pressure either of
conducting medium. Frequency of damped oscillation increases with increasing of
Alfven velocity in both fluids. The bubble growth will be saturated if we increase the
viscosity of the fluids keeping unchanged Alfven velocity. Again, under the influence
of combined effect of viscosity, surface tension and magnetic field the bubble growth
will be RMI like i.e., \( \gamma \rightarrow \frac{1}{\tau} \).

York, 1981.
magnetic field on temporal development of Rayleigh Taylor instability induced