Magnetic inhibition effect on the Rayleigh-Taylor instability in non-resistive magnetohydrodynamics

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The Rayleigh-Taylor (RT) instability is well known as gravity-driven instability in fluids when a heavy fluid is on top of a light one. It appears in a wide range of applications in science and technology, such as in inertia confinement fusion, Tokamak, supernova explosions. In this talk, mathematical analysis of the magnetic RT instability in both incompressible and compressible fluids will be presented, in particular, effects of (impressed) magnetic fields upon the growth of the RT instability will be discussed and analyzed quantitatively. We shall show that a sufficiently strong (impressed) magnetic field can inhibit the RT instability; otherwise, instability will still occur in the sense that solutions do not continuously depend on initial data. Moreover, we shall give an explanation of physical mechanism for the magnetic inhibition phenomenon based on mathematical analysis.