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The role of Peclet number in 3-D mixing inside drops VINOD NARAYANAN, GEORGE M. HOMSY, University of California Santa Barbara — We consider the problem of mass transfer from a circulating liquid drop in which the flow produces 3-D chaotic trajectories of passive non-diffusing particles. The aim is to investigate effect of Peclet number, Pe, on the transport rates in such situations. The flow field is produced by applying an axial electric field, and by switching the field direction through an angle β at constant time intervals. The 3-D advection-diffusion equation is solved numerically to obtain the concentration field, and the total mass in the drop follows an exponential decay. The enhancement factor, defined as the decay constant normalized by that for diffusion alone, shows a steep increase with Pe for large Pe, indicating large enhancement of the transport rate. An optimal switching period that maximizes the enhancement is obtained. Movies of the simulations shows the existence of periodically repeating spacial structures in the concentration field ("strange eigenmodes").

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