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Characterization of Mixing Between Water and Biofuels[1] ALINE COTEL, ERICA GREEN, MARINA ACEVEDO, MARGARITA OTERO, AVERY DEMOND, University of Michigan — Currently, gasoline containing ethanol is considered to be among the best alternatives to gasoline. However, the potential environmental impact of a spill of ethanol-based biofuels on aquatic environments is an area of open discussion and research. Since these fuels are a combination of a miscible fluid (ethanol) and an immiscible fluid (gasoline), models used for traditional gasoline fuels (immiscible in water) are not applicable. Preliminary experiments show that when a solution of ethanol and glycol is mixed with water, a third mixed fluid is formed. Two distinct mixing regimes were observed. An exothermic reaction also occurred between ethanol and water. In the first regime, a turbulent wake is created between the ethanol/glycol and water layers causing the ethanol and glycol solution to entrain and mix into with the water phase. Because the mixed fluid is denser than either parent fluid, a dramatic overturning is possible. The amount of mixing was found to be dependent upon the initial ratio of ethanol to glycol in the parent fluid. The second regime begins when the turbulent wake has dissipated and the internal wave created by the plate has begun to settle, typically within the first minute. At this point, Bénard-like cells, similar to those typically seen in Rayleigh-Bénard convection, form at the interface and relatively slow mass transfer is evident. The cells at the interface show distinct features of interfacial turbulence, including small transverse waves, denoting that instabilities exist there.

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