

Abstract Submitted  
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**Fluidic Channels Produced by Electro Hydrodynamic Viscous Fingering** KRISTOPHER BEHLER, ERIC WETZEL, U.S. Army Research Lab — Viscous fingering is a term describing fingerlike extensions of liquid from a column of low viscosity liquid that has been injected into a more viscous liquid. The modification of viscous fingering, known as electro hydrodynamic viscous fingering (EHVF), utilizes large electrical potentials of 10-60 kV. The fingers see a reduction in size and increase in branching behavior due to the potential applied to the system. The resulting finely structured patterns are analogous to biological systems such as blood vessels and the lymphatic system. In this study silicone oils and water were studied in thin channel Hele-Shaw cells. The interfacial tension was optimized by altering the surfactant concentration in the silicone oils. EHVF of liquid filled packed beds consisting of beads and silicone oils showed retardation of the relaxation of the fingers after the voltage was turned off. Decreased relaxation provides a means to solidify patterns into a curable material, such as polydimethylsiloxane (PDMS). After the water is evacuated from the fingers, the cured materials then possess hollow channels that can be refilled and emptied, thus creating an artificial circulatory system.

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