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Influence of chemical reaction decreasing interfacial tension on immiscible viscous fingering REIKO TSUZUKI, MASANARI FUJIMURA, NAGATSU YUICHIRO, Tokyo University of Agriculture and Technology — We have experimentally investigated the effects of chemical reaction on immiscible viscous fingering (VF). In the present study, we use a chemical reaction producing a surfactant leading to a decrease in interfacial tension. In our experiment, a more viscous paraffin oil containing linoleic acid is displaced by a less viscous NaOHaq in a radial Hele-Shaw cell. We have found the influence of the reaction on the VF pattern depends on the displacement flow rate. At low flow rate, the reaction makes the fingers narrower. On the other hand, at intermediate flow rate, the reaction makes the fingers wider. At high flow rate, there is little influence of the reaction. These results can be interpreted as follows; when the reaction rate is much faster than the flow rate, interfacial tension is decreased uniformly over the interface. As a result, more finger-splitting occur and the fingers become narrower. When the reaction rate and flow rate are competing, the interfacial tension gradient is formed along the interface. As a result, Marangoni convection is produced, which leads to wider fingers. When the flow rate is much faster than the reaction rate, little reaction occurs during the formation of VF. As a result, the reaction does not influence on VF pattern.

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