



Contribution ID: 620

Type: Oral Presentation

Wettability effects on multiphase displacements in heterogeneous porous media

Friday, 4 June 2021 15:00 (15 minutes)

We have studied wettability effects on multiphase displacements in heterogeneous porous media by experiments on microfluidic chips. The developed analysis method on high-resolution images enabled us to link pore-scale physics and macroscopic consequences. By varying fluid properties to achieve a wide range of contact angles θ ($23^{\circ} \le \theta \le 127^{\circ}$), we find a non-monotonic rule of wettability effects on displacement efficiency on the heterogeneous porous structure which leads to a consequent preferential flow, in contrast to a monotonic one of wettability effects on the homogeneous matrix structure. Similar to nature, for the flow on heterogeneous porous media, there is a critical wettability for the best displacement efficiency. Pore-scale mechanisms are identified to elucidate these behaviors: cooperative pore filling in the intermediate water-wet condition cause the maximum displacement efficiency; corner flow in strong water-wet condition and Haines events in strong oil-wet condition will decrease displacement efficiency. Our findings shed unique insights on how the interaction between wettability and preferential flow pathway affects fluid displacement in porous media.

Time Block Preference

Time Block A (09:00-12:00 CET)

References

Acceptance of Terms and Conditions

Click here to agree

Newsletter

Student Poster Award

Yes, I would like to enter this submission into the student poster award

Primary authors: LEI, Wenhai; WANG, Moran (Tsinghua University)

Presenter: LEI, Wenhai

Session Classification: MS6-A

Track Classification: (MS6-A) Physics of multi-phase flow in diverse porous media