IDENTIFICATION OF NOVEL INTERFACE DOMAINS IN GEOLOGIC MEDIA

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Pore-scale fluid processes in geological media are critical for applications such as oil and gas recovery, radioactive waste disposal, carbon sequestration, soil moisture distribution, soil and groundwater pollution, and land stability. The continued improvement of high-resolution image acquisition and processing methods has provided a means to directly measure pore-scale fluid processes for natural geomedia, and to test the usefulness of theoretical and computational models developed to simulate them. We are using high-resolution synchrotron X-ray microtomography in combination with advanced visualization tools to characterize fluid distributions and fluid-fluid interfaces in natural geologic media. The studies revealed the presence of fluid-fluid interface associated with macroscopic features such as pits and crevices on the surfaces of the solids. These features and respective fluid interfaces, which are not accounted for in current theoretical or computational models, may have a significant impact on accurate understanding and simulation of multi-phase flow, energy, heat, and mass transfer, and contaminant transport.