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Upscaling Colloid Transport and Retention under Unfavorable Conditions

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We describe traditional upscaling techniques under favorable conditions for colloid attachment in order to identify and highlight characteristics that may differ under unfavorable conditions. We then examine existing upscaling approaches under unfavorable conditions that are based on two-region models and relate the governing rate constants to pore-scale physicochemical processes. Pore-scale processes that influence upscaling strategies under unfavorable conditions, including colloid accumulation in secondary energy minima and hydrodynamic mixing at grain boundaries, are examined. These influences on upscaling are discussed, and the resulting relationship of pore and grain connectivity to upscaling is explored.