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Numerical Investigation of Spontaneous Imbibition of Power Law Fluids in Partially Saturated Porous Mediums

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In this study, numerical investigation of Richard's equation of physiological liquids obeying power law rheological behavior has been investigated in partially double layered porous mediums based on effective viscosity concept. COMSOL Multiphysics has been selected to numerical solution of governing equations. Based on the obtained numerical results, the range of Reynolds number (which is defined based on averaged channel's inlet velocity) has always shown the values too smaller unity for different values of power law indexes which is an implicitly credential of validity of Darcy equation governed in porous mediums. Beside this, the results have shown the value of absorbed mass by the system has notably increased lower power law indexes (described as an improvement in the fluid's shear thinning behavior). Similarly, for a given power law fluid, increase on the thickness of the layer including larger permeability, leads to increase on the value of absorbed mass by the double layer porous mediums.
Keywords: Richard's Equation; Physiological Fluids; Power law model; Effective Viscosity; COMSOL Software.

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