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Permeability prediction of isotropic fibrous porous media[1] SONIA WOUDBERG, J. PRIEUR DU PLESSIS, Stellenbosch University — Fibrous porous media find application in several industrial engineering disciplines including filtration processes and fuel cells. In the present study a geometric pore-scale model is introduced and used to predict the permeability of isotropic fibrous porous media. The model is based on a unit cell approach in which the fibres of the actual porous medium are modelled based on rectangular geometry. At first the model is used to predict the permeability of cross-flow through an array of unidirectional fibres. The permeability is expressed as a function of the solid volume fraction and a pore-scale linear dimension. In addition a three-dimensional isotropic model is proposed by performing a weighted average on the model for cross-flow and a model from the literature for flow parallel to the fibre axes. The resulting model is compared to a comprehensive collection of experimental data from numerous authors, based on various types of fibrous porous media, including that of entangled polymer networks. The Kozeny "constant" is calculated for different solid volume fractions and it is illustrated that the pore-scale model introduced conserves the constancy of the Kozeny constant.

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