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Heat transfer through pore space in packed beds of non-spherical particles

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Packed beds or granular systems and sintered or fibrous porous media are of specific interest in geosciences, the chemical industry, battery technologies and electrochemical cells. In these systems, the geometry and size of the pore space depends on the particle shape [1]. Heat transport through the porous packed beds strongly depends on the tortuosity of the pore space, as it forms a resistance for gas transport. Tortuosity itself depends on porosity, specific surface area and pore morphology [2,3]. There have been several attempts to find correlations and dependency of physical parameters on tortuosity, but the results are very specific and no universal approach has been derived. In this work, the new particle parameters sphericity and aspect ratio are introduced to a correlation from [4] that yet included only a function on porosity. To achieve this, particle beds of different particle shapes and aspect ratios were created using Blender software with a rigid body simulation tool. Steady-state thermal simulations of heat conduction through the packed beds were carried out using the finite element method in software ANSYS. The heat flux results obtained were compared with the equation from [4,5] and utilized to develop the correlations with sphericity and aspect ratio.
References
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References

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