IPASJ International Journal of Mechanical Engineering (IIJME)
Web Site: http://www.ipasj.org/IIJME/IIJME.htm
A Publisher for Research Motivation........
Email: editoriijme@ipasj.org
Volume 2, Issue 12, December 2014
ISSN 2321-6441

Analysis of Modeling the Effect of different Multi Phase Properties

[1]Harish Kumar Sublania, [2]K.J. Singh [3]R.Singh

[1]Scholor, M.G.S.University of Bikaner (Raj)

[2]Govt College Suratgarh, Distt-Sriganganagar (Raj.)

[3] University of Rajasthan , Jaipur (Raj.)

ABSTRACT

As we all of us are aware that Heat Transfer has great impact in today life. It has been observed that in the last many years there has been a large enhancement in the use of Heat Transfer. Due to wide use of these phenomena of Heat Transfer there is a requirement of Study of pore-scale modeling to study multiphase flow in porous media. Different properties of pore like fluid arrangements, computations of relative permeability, interfacial area, dissolution rate and many other physical properties have been made. Combined with a realistic description of the pore space, predictive modeling of a variety of processes, Due to above reasons the study about modeling the Effect of Phase Properties is urgently required. In this Paper we have described the Model of the Effect of Multi Phase Properties.

Keywords:- Effective thermal conductivity (ETC); Binder conformability, Parameter modeling

1. INTRODUCTION

The Effective Thermal Conductivity of porous multiphase systems is not only defined by the thermal conductivities of the materials concerned, but, even more prominently, by the structural relations of the components. Since the materials themselves, particularly the binder phase can have a dissimilar effect on the coating structure; this paper promote examines the role of latex binder on the covering structure and its resulting influence on the effective thermal conductivity. This evaluation is conventional out in three ways. At first, the thermal diffusivities of the model coatings with different lattices are intended. Consequent calculation of the equivalent thermal conductivities initiates a discussion regarding the role of connectivity in these systems. Secondly, with the backing of mercury porosimetry measurements of the model systems, the role of porosity and colloidal forces in consolidation are further investigated. Simulations of idealized two dimensional particle pickings are also undertaken to complement and compare with the porosimetry data. The role of connectivity can be further developed by fitting the Lumped Parameter Model to the calculated thermal conductivities and porosities. This permits separation of the effects of porosity and particle packing distinctiveness from that of the connectivity formed by the binder. While the discussion in this chapter focuses on thermal conductivity, the clarification of coating structure using these techniques is of fundamental general interest.

2. EFFECTIVE THERMAL CONDUCTIVITY & PORE STRUCTURE

Fig-1 shows the thermal conductivities designed from the measured thermal diffusivities. One can see that the thermal conductivities of rigid latex hold structures are generally honored than those of the intermediate and soft latex structures.

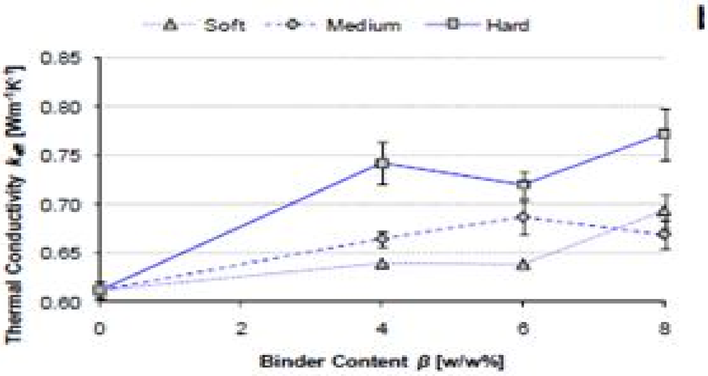

Fig-1 Thermal conductivity as a function of binder content for soft, medium and hard latex.

The rigid latex behaves another way between the trios. When originally adding small quantities of the tough latex, there is a large increase in thermal conductivity because there is the least commotion of the pigment packing. This is empirical as the lowest increase in porosity. A feature studied further in the later modeling of connectivity. Adding more of the hard sphere latex now lowers the pigment to pigment contact, and, therefore, acts disruptively as hard latex spheres are placed at the nodal points of pigment contact. While the hard latex thus far behaves similarly to the medium latex, it is, however, not conformable under the consolidation forces, and therefore acts as a hard sphere, which, by definition, has little or zero connectivity to a adjacent hard particle.

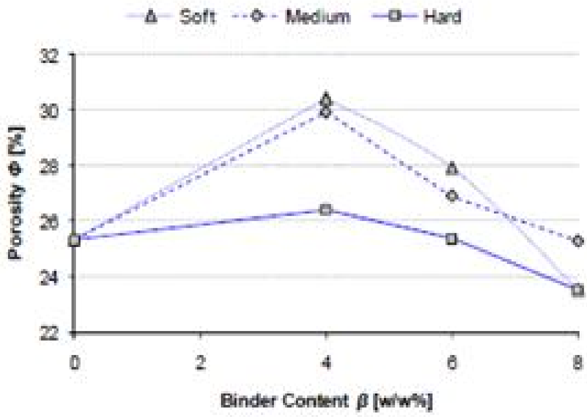

Fig-2 Porosities measured by mercury porosimetry for tablets with soft, medium and hard

3. MODELING THE EFFECT OF PHASE PROPERTIES

Therefore, in difference to the medium latex acting at pigment nodal points to augment the connectivity of pigment particles, even though commotion of the packing might occur, the hard sphere latex, because of its low contact to pigment, reduces connectivity, thus reducing thermal conductivity at this structural arrangement In terms of porosity, the elastic latex behaves very likewise to the medium one. However, the thermal conductivity increases slower upon latex addition and reaches the level of the maximum thermal conductivity shown by the medium latex at a level of 8 w/w%.

4. CONCLUSIONS

For the methodology part of this work, both a dimension method and a model for computation of effective thermal conductivity were introduced and discussed. The transient method for the measurement of thermal diffusivity was exposed to be accurate enough to permit analysis of different pigment/binder tablet materials and structures. The pigment/binder tablet material used for the measurements was shown to relate well to the structures as found in heavy weight paper coatings. This method was therefore adopted to measure and discuss thermal diffusivity in the succeeding studies.

5. FUTURE SCOPE

5.1 Optimization and Characterization

Process optimization can only be achieved by having comprehensive information of the process, counting the materials involved. The growing cost of energy and the growing consciousness for an effective use of energy will highlight the need to understand even small scale energy dissipation. This work has shown, on the one hand, that the thermal properties can take part in an important role in the optimization of energy efficiency and product quality in processes that compact with the application of heat to porous media.

5.2 Homeomorphism

The above stated need to distinguish porous media often leads to modeling a three dimensional system by projecting it onto two dimensional structures or using two dimensional equivalents. By doing so in this work, it was observed that this may have drawbacks first of all, although it is driven by practical reasons. The calculation demand for simulations in two dimensions is much lower than tackling the same problem in three dimensions. This holds even for today's high speed computing solutions. Furthermore, a two dimensional system is more concrete and also easier to visualize.

5.3 Skeletal Structures

The class of porous media primarily discussed in this work was defined by three phases, for which the thermal conductivity differed by a factor of ten. Due to that, their role in respect to each other,

6 .ACKNOWLEDGEMENT

It gives me immense pleasure in Research paper on topic “Analysis of Modeling the Effect of different Multi Phase Properties” I acknowledge the enormous assistance and excellent co-operation extended by my respected Guide Dr. Kamaljeet Singh, Professor. Govt College Suratgarh, Distt- Sriganganagar (Raj.), India, you have been a tremendous mentor for me. I would like to thank you for encouraging my research and for allowing me to grow as a research scholar. Your advice on both research as well as on my career have been priceless. I would also like to take this opportunity to special thanks Dr Ramvir Singh, Professor, Department of Physics University of Rajasthan Jaipur (Raj.), for their very helpful comments and suggestions.

REFERENCES

[1] D. Jougnot and A. Revil, “Thermal conductivity of unsaturated clay-rocks,” Hydrology and Earth System Sciences, vol. 14, no. 1, pp. 91–98, 2010.
[2] C. Gruescu, A. Giraud, F. Homand, D. Kondo, and D. P. Do, “Effective thermal conductivity of partially saturated porous rocks,” International Journal of Solids and Structures, vol. 44, no. 3-4, pp. 811–833, 2007.
[3] M. Stefanidou,M. Assael, K. Antoniadis, and G.Matziaroglou, “Thermal conductivity of building materials employed in the preservation of traditional structures,” International Journal of Thermo physics, vol. 31, no. 4-5, pp. 844–851, 2010.
[4] Chen, D., Pyrak-Nolte, L., Griffin, J. & Giordano, N. (2007). Measurement of interfacial area per volume for drainage and imbibition, Water Resources Research 43(12).
[5] Joekar-Niasar, V., Hassanizadeh, S. M. & Leijnse, A. (2008). Insights into the relationship among capillary pressure, saturation, interfacial area and relative permeability using pore-scale network modeling, Transport in Porous Media 74: 201–219.
[6] Joekar-Niasar, V., Hassanizadeh, S. M., Pyrak-Nolte, L. J. & Berentsen, C. (2009).Simulating drainage and imbibitions experiments in a high-porosity micro-model using an unstructured pore-network model, Water Resources Research 45(W02430, doi:10.1029/2007WR006641).
[7] Niessner, J. & Hassanizadeh, S. (2009a). Modeling kinetic inter phase mass transfer for two-phase flow in porous media including fluid–fluid interfacial area, Transport in Porous Media . doi:10.1007/s11242-009-9358-5.
[8] Niessner, J. & Hassanizadeh, S. (2009b). Non-equilibrium inter phase heat and mass transfer during two-phase flow in porous media—theoretical considerations and modeling, Advances in Water Resources 32: 1756–1766
[9] Porter, M., Schaap, M. & Wildens child, D. (2009). Lattice-boltzmann simulations of the capillary pressure-saturation-interfacial area relationship for porous media, Advances in Water Resources 32(11): 1632–1640.
[10] van Antwerp, D., Falta, R. & Gierke, J. (2008). Numerical Simulation of Field-Scale Contaminant Mass Transfer during Air Sparging, Vadose Zone Journal 7: 294–304.
[11] Oulaid O., B. Benhamou, N. Galanis (2009), "Effet de l’inclinaison sur les transferts couples de chaleur et de masse dans un canal" IXème Colloque Inter-Universitaire Franco–Québécois Thermique des systèmes CIFQ2009, 18-20 mai 2009, Lille, France
[12] Oulaid Othmane (2010), Transferts couplés de chaleur et de masse par convection mixte avecchangement de phase dans un canal, Ph. D. Thesis, Jointly presented at Cadi Ayyad Univesity Marrakech (Morocco) and University of Sherbrooke (Canada).
[13] Oulaid O., Benhamou B., Galanis N. (2010b), Mixed Convection Heat and Mass Transfer with Phase Change and Flow Reversal in Channels, Int. J. Heat Fluid Flow, 31,711-721 (doi:10.1016/j.ijheatfluidflow.2010.04.007).
[14] Maré, T., Galanis, N., Voicu, I., Miriel, J., Sow, O., (2008) Experimental and numerical studyof mixed convection with flow reversal in coaxial double-duct heat exchangers, Exp. Therm. Fluid Sci., 32, 1096–1104.
[15] Laaroussi N., Lauriat G. & Desrayaud G. (2009), Effects of variable density for film evaporation on laminar mixed convection in a vertical channel, Int. J. Heat Mass Transfer, 52, 151-164.
[16] Kassim M. A., Benhamou B., Harmand S., Cherif A. S., Ben Jabrallah S. (2009) " Etudenumérique et experiment ale sur les transferts couplés de chaleur et de masse avec changement de phase dans un canal vertical adiabatique " IXème Colloque Interuniversitaire Franco–Québécois Thermique des systèmes CIFQ2009, 18-20 mai 2009,Lille, France
[17] Kassim M. A., Cherif A. S., Benhamou B., Harmand S. et Ben Jabrallah S. (2010b)7 etude numérique et expérimentale de la convection mixte thermosolutale accompagnant un écoulement d’air laminaire ascendant dans un canal vertical adiabatique. 1er Colloque International Francophone d’Energétique et Mécanique (CIFEM’2010), Saly, 17-19 mai 2010, Senegal
[18] Agunaoun A., A. Daif, R. Barriol, & M. Daguenet (1994), Evaporation en convection force d’un film mince s´écoulant en régime permanent, laminaire et sans ondes, sur une surface plane inclinée, Int. J. Heat Mass Transfer, 37, 2947–2956.

[19] 2009 Moran Wang and Ning Pan, Elastic property of multiphase composites with random microstructure, Journal of Computational Physics, 228, 5978–5988.2009 Jing Gao, Ning Pan and Weidong Yu, Fractal character forecast of down fiber assembly microstructure, Journal of Textile Institute, 100, 539–544.

[20] 2009 Qun Chen, Moran Wang, Ning Pan, Zengyuan Guo, Optimization principles for convective heat transfer, Energy, 34, 1199–1206.

[21] 2009 Malcolm M. Q. Xing, Xiaoying Hui, Wen Zhong, Ning Pan, Frank Yaghmaie, H. I. Maibach, In vitro human topical bioactive drug transdermal absorption: Estradiol, Cutaneous and Ocular Toxicology, 28, 171-175.

[22] 2009 Qun Chen, Moran Wang, Ning Pan, Zengyuan Guo, Irreversibility of Heat Conduction in Complex Multiphase Systems and Its Application to the Effective Thermal Conductivity of Porous Media, International Journal of Nonlinear Sciences and Numerical Simulation, 10, 7-16.

[23] 2010 Lukas, D., Pan, N., Sarkar, A., Weng M., Chaloupek, J., Kostakova, E., Ocheretna, L., Mikes,P., Pociute, M. and Amler, E., Auto-model based computer simulation of Plateau-Rayleigh instability of mixtures of immiscible liquids, Physica A., 389, 2164-2176.

[24] 2009 Qun Chen, Moran Wang, Ning Pan, Zengyuan Guo, Irreversibility of Heat Conduction in Complex Multiphase Systems and Its Application to the Effective Thermal Conductivity of Porous Media, International Journal of Nonlinear Sciences and Numerical Simulation, 10, 7-16.

[25] 2010 Lukas, D., Pan, N., Sarkar, A., Weng M., Chaloupek, J., Kostakova, E., Ocheretna, L., Mikes,P., Pociute, M. and Amler, E., Auto-model based computer simulation of Plateau-Rayleigh instability of mixtures of immiscible liquids, Physica A., 389, 2164-2176.

[26] 2010 Wang M. R., Chen Q., Kang Q. J., and Pan N., Ben-Naim E., Nonlinear effective properties of unsaturated porous materials, International Journal of Nonlinear Sciences and Numerical Simulation, 11, 49-56.

[27] 2010 Chen Q., Yang K. D., Pan N. and Guo Z.Y., A new approach to analysis and optimization of evaporative cooling system I: Theory, Energy, 35, 2448-2454.

[28] 2010 Yiming Gan, Ling Cheng, Xin Ding and Ning Pan, Blood flow fluctuation underneath human forearm skin caused by local thermal stimuli of different fabrics, Journal of Thermal Biology, 35, 352-377.