Simulation of Non-sticking Multi-component Flow By Lattice Boltzmann Method

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Abstract: We present a lattice Boltzmann study of multi-component flow where the fluid components will not sticking with each other. It uses the interaction model which is firstly proposed by Shan and Chen (1993). We know that in many multi-component systems, such as blood flow with white cells and red cells inside, the components may not stick together. Currently, this is little investigated by others. Inspired from the intuition, we analyze the influence of the interaction force between different components. We find the non-sticking could be implemented by assigning different forces to different pairs of components. The model is validated by Poiseuille flow and the critical points for binary phases. Some preliminary results are shown in this paper.

Some numerical results are displayed as follows.

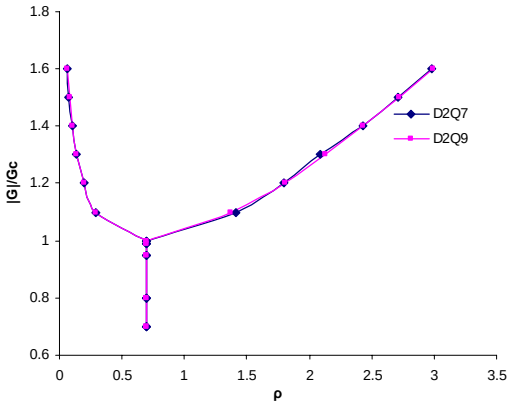
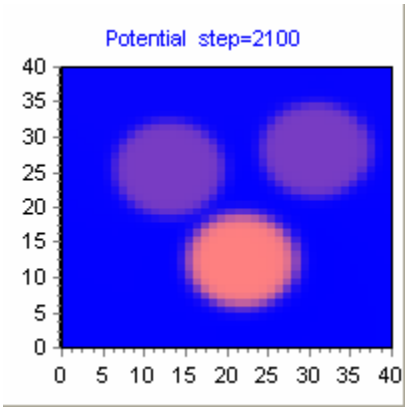


Fig. 1 Critical Points



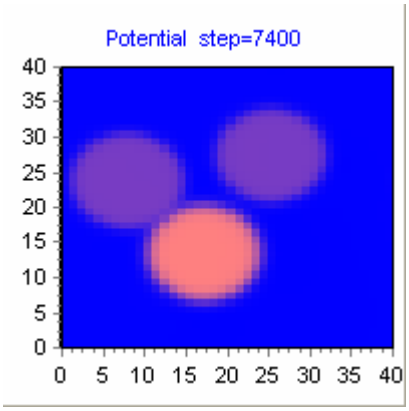
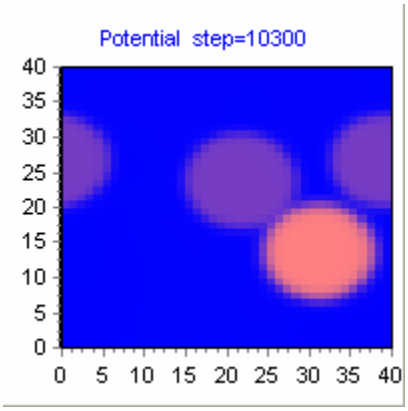


Fig. 2

Fig. 3



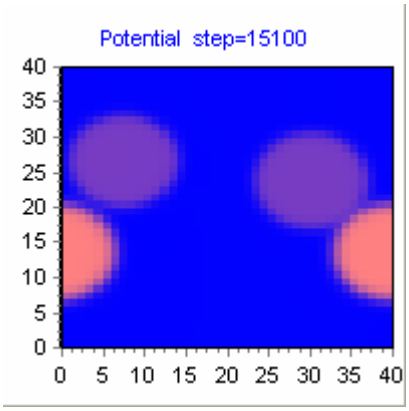


Fig. 4

Fig. 5

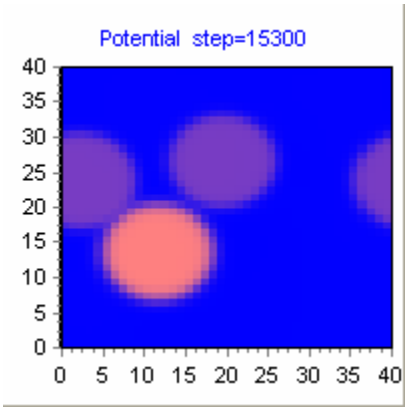


Fig. 6

References

Shan, X. and Chen, H., Lattice Boltzmann model for simulating flows with multiple phases and components, *Phys. Rev. E* 47(3),1815–1819,1993.