Supporting Information. Capillary interactions, aggregate formation and the rheology of particle-laden flows: a lattice Boltzmann study

Lei Yang,[†] Marcello Sega,[†] Steffen Leimbach,[‡] Sebastian Kolb,[‡] Jürgen Karl,[‡] and Jens Harting[*,¶,§]

†*Helmholtz Institute Erlangen-Nürnberg for Renewable Energy (IEK-11), Forschungszentrum Jülich, Fürther Straße 248, 90429 Nürnberg, Germany*

‡*Chair of Energy Process Engineering, Friedrich-Alexander-Universität Erlangen-Nürnberg, Fürther Straße 244f, 90429 Nürnberg, Germany*

¶*Helmholtz Institute Erlangen-Nürnberg for Renewable Energy (IEK-11), Forschungszentrum Jülich, Fürther Straße 248, 90429 Nürnberg, Germany*

§*Department of Chemical and Biological Engineering and Department of Physics, Friedrich-Alexander-Universität Erlangen-Nürnberg, Fürther Straße 248, 90429 Nürnberg, Germany*

E-mail: j.harting@fz-juelich.de

Phone: +49 911 32169-113

This information is available free of charge via the Internet at http://pubs.acs.org/.

The definitions of the coefficients f_1, f_2, f_3 and f_4 for capillary force model are

$$
\begin{aligned}
f_1 = \quad & -0.44507 + 0.050832\,\theta - 1.1466\,\theta^2 \\
& -(0.1119 + 0.000411\,\theta + 0.1490\,\theta^2)\ln\bar{V} \\
& -(0.012101 + 0.0036456\,\theta + 0.01255\,\theta^2)(\ln\bar{V})^2 \\
& -(0.0005 + 0.0003505\,\theta + 0.00029076\,\theta^2)(\ln\bar{V})^3
\end{aligned}
$$

$$
\begin{aligned}
f_2 = \quad & 1.9222 - 0.57473\,\theta - 1.2918\,\theta^2 \\
& -(0.0668 + 0.1201\,\theta + 0.22574\,\theta^2)\ln\bar{V} \\
& -(0.0013375 + 0.0068988\,\theta + 0.01137\,\theta^2)(\ln\bar{V})^2
\end{aligned}
$$

$$
\begin{aligned}
f_3 = \quad & 1.268 - 0.01396\,\theta - 0.23566\,\theta^2 \\
& +(0.198 + 0.092\,\theta - 0.06418\,\theta^2)\ln\bar{V} \\
& +(0.02232 + 0.02238\,\theta - 0.009853\,\theta^2)(\ln\bar{V})^2 \\
& +(0.0008585 + 0.001318\,\theta - 0.00053\,\theta^2)(\ln\bar{V})^3
\end{aligned}
$$

$$
\begin{aligned}
f_4 = \quad & -0.010703 + 0.073776\,\theta - 0.34742\,\theta^2 \\
& +(0.03345 + 0.04543\,\theta - 0.09056\,\theta^2)\ln\bar{V} \\
& +(0.0018574 + 0.004456\,\theta - 0.006257\,\theta^2)(\ln\bar{V})^2,
\end{aligned}
$$

where $\bar{V} = (4/3)\pi V/V_p$.

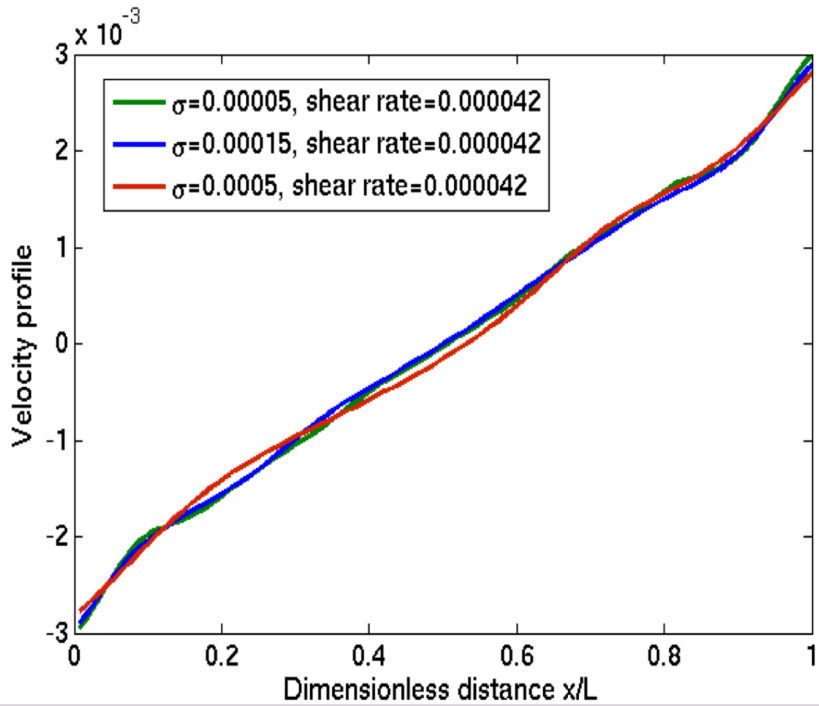

Figure 1: Velocity profiles showing the region where the linear fit is performed

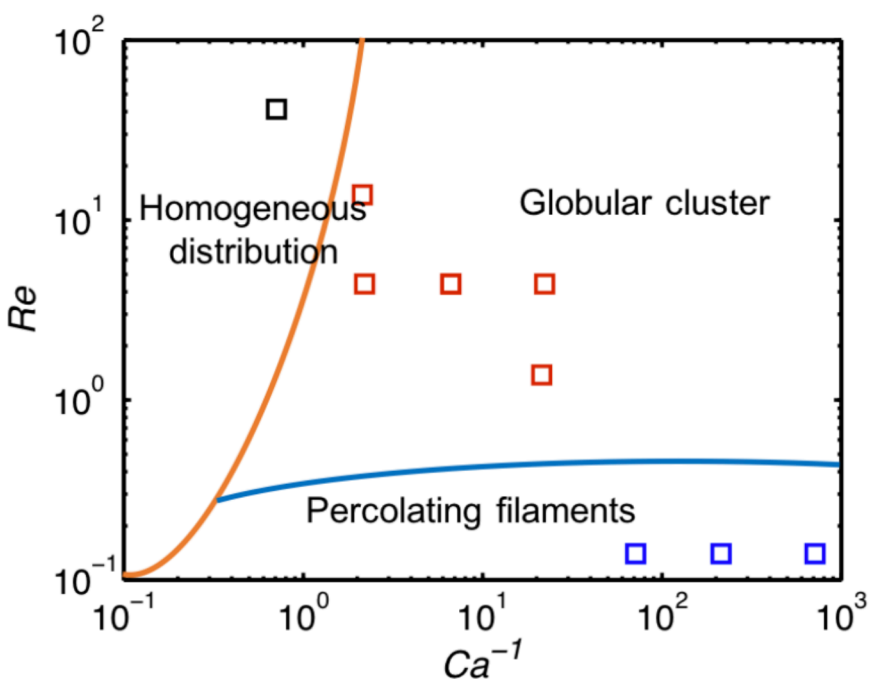

Figure 2: Schematic phase diagram showing in a qualitative way the occurrence of different type of structures in the plane (Re,Ca^{-1}).