Multiscale model of sintering: diffusion and plastic flow– PARTICLES 2017

Brice W. Kabore* and Bernhard Peters†

* Université du Luxembourg, Faculté des Sciences, de la Technologie et de la Communication, Campus Kirchberg, 6, rue Coudenhove-Kalergi, L-1359 Luxembourg, Luxembourg e-mail: bricewendlassida.kabore@uni.lu, web page: http:/www.xdem.de

† Université du Luxembourg, Faculté des Sciences, de la Technologie et de la Communication, Campus Kirchberg, 6, rue Coudenhove-Kalergi, L-1359 Luxembourg, Luxembourg e-mail: bernhard.peters@uni.lu, web page: http:/www.xdem.de

ABSTRACT

Impacting particles or static aggregated particles at high temperature may undergo a permanent change of shape modifying the microstructure. Two particles in contact can develop some bonds within sub-second time. This fast sintering force in the particular case of the snow contribute to the rheological behavior and grain rearrangement [1]. Understanding the kinetics of sintering in granular material is of great importance in some engineering applications.

For decades, diffusional processes have received more attention in investigations related to the mechanisms behind sintering [2]. Some works have suggested that the plastic flow might be neglected in sintering process for stresses are not high enough to cause dislocation. However, some studies have showed that stresses experienced in fine particles necks can be high enough and even lead to plasticity driven sintering. The importance of each mechanism in the sintering process may lie in the temporal and spatial scale of interest.

Increasing importance is being accorded to the role of plastic flow in sintering. however, several investigations have proved that the conventional plasticity theory may fail to predict plastic activity at micro-scale,

The objective of this work is to develop adequate computational model that includes instantaneous and time-dependent plastic flow at micro-scale. We aim at extending existing models of sintering and plasticity to cope with multiple spatial and temporal scales simulations using Extended Discrete Element Method. The numerical results are compare to experimental data on snow.

REFERENCES

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