On the Statistical Mechanics of Powders

Ali Ghaderi

Tel-Tek
Department of POSTEC
Kjølnes Ring
N-3918 Porsgrunn
Norway
Ali.Ghaderi@tel-tek.no

Physics of powders offers numerous challenges with far reaching implications for many seemingly different areas. The main reason is due to some apparently intractable complexities. In particular, the "dual" nature of powders, wherein they simultaneously exhibit both macroscopic discrete organization and microscopic continuous behaviour, in which both chaos and new order may emerge.

An immediate consequence of complexities involved in powder systems is that it is rarely possible to have a complete overview of all parameters affecting the system under study. This implies that, in general, one is only in position to describe the most probable states based on the available information. This means that in this context, the function of a theory is to describe our incomplete state of the knowledge. Nevertheless, this theory should have the flexibility of being modified to explain new facts, which are not known to us yet. This also means that the theory developed, in general, would not fulfil Popper's falsifiability criteria. For this reason the falsifiability is replaced with a lesser strict criteria, which we termed irrationalability.

In this presentation, efforts are made to show how the irrationalability criteria would lead to a statistical theory for powders. In this relation concepts like Heterogeneity landscape and mixture entropy are explained and some examples on their importance, both from practical and theoretical point of view are given.