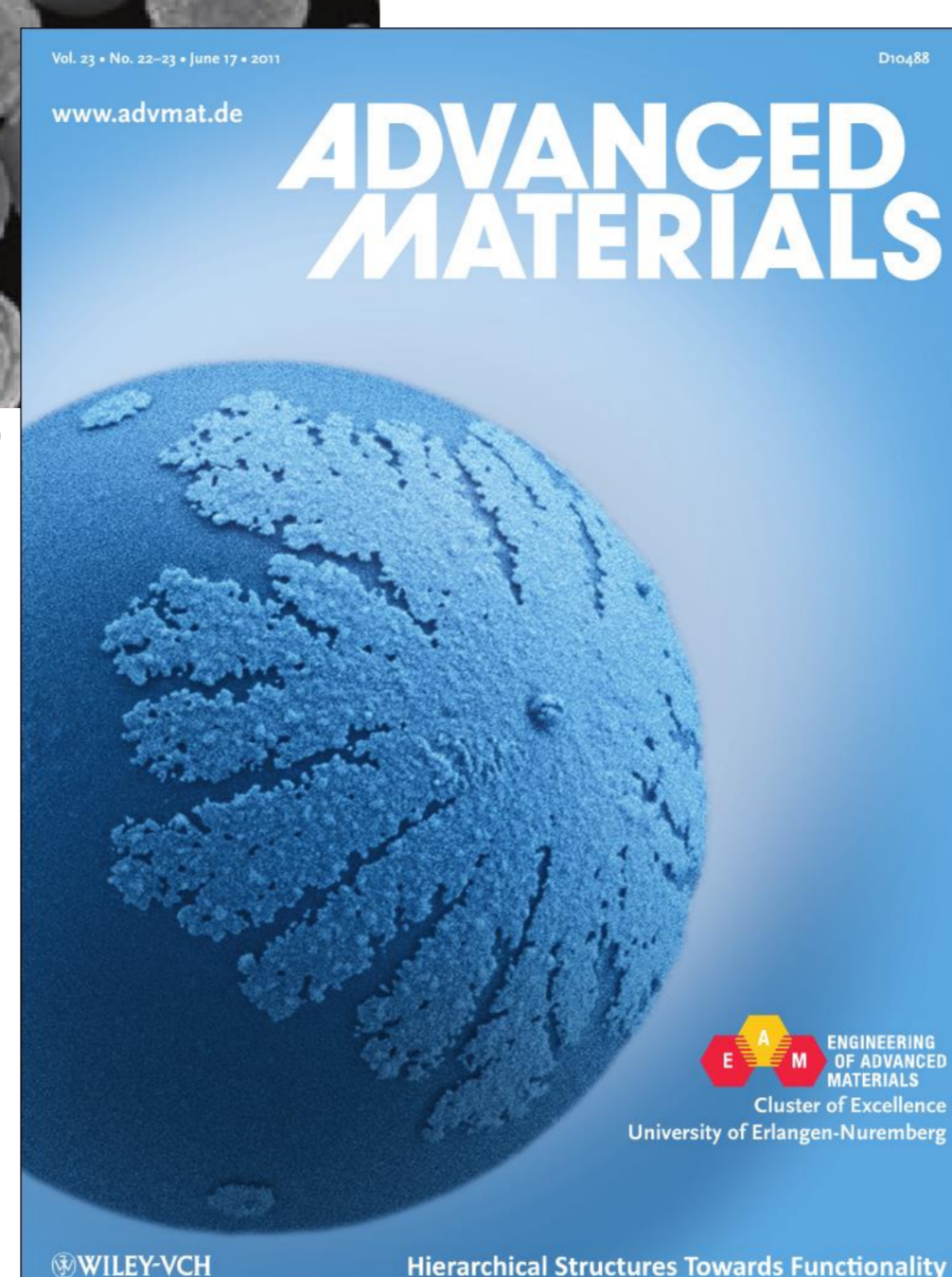


starting point

- Patchy particles are characterized by heterogeneous surface properties.
- The resulting anisotropic chemical and physical behavior makes patchy nano- and microparticles interesting for novel applications.
- Recently a one-pot colloidal method for the facile synthesis of gold/silver patches on silica/polystyrene nanospheres has been described ^{1), 2), 3)}.
- The corresponding patch growth process is not completely understood.



aims

understand and control the deposition of patches on nanospheres from the fluid phase

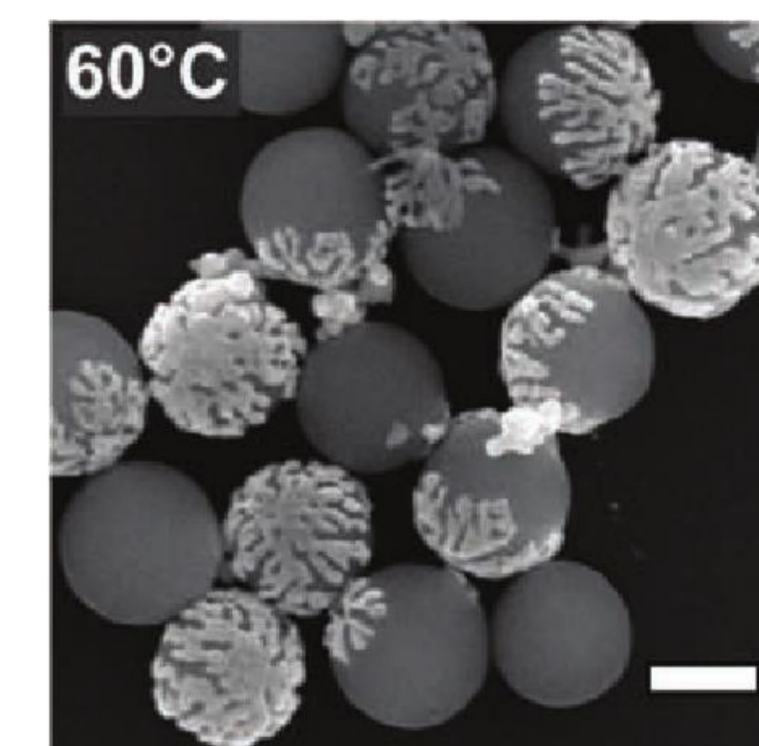
- sound model for the deposition process
- efficient simulation of the deposition process
- deposition on complex shaped surfaces

approach

diffusion limited aggregation



en.wikipedia.org/wiki/Diffusion-limited_aggregation

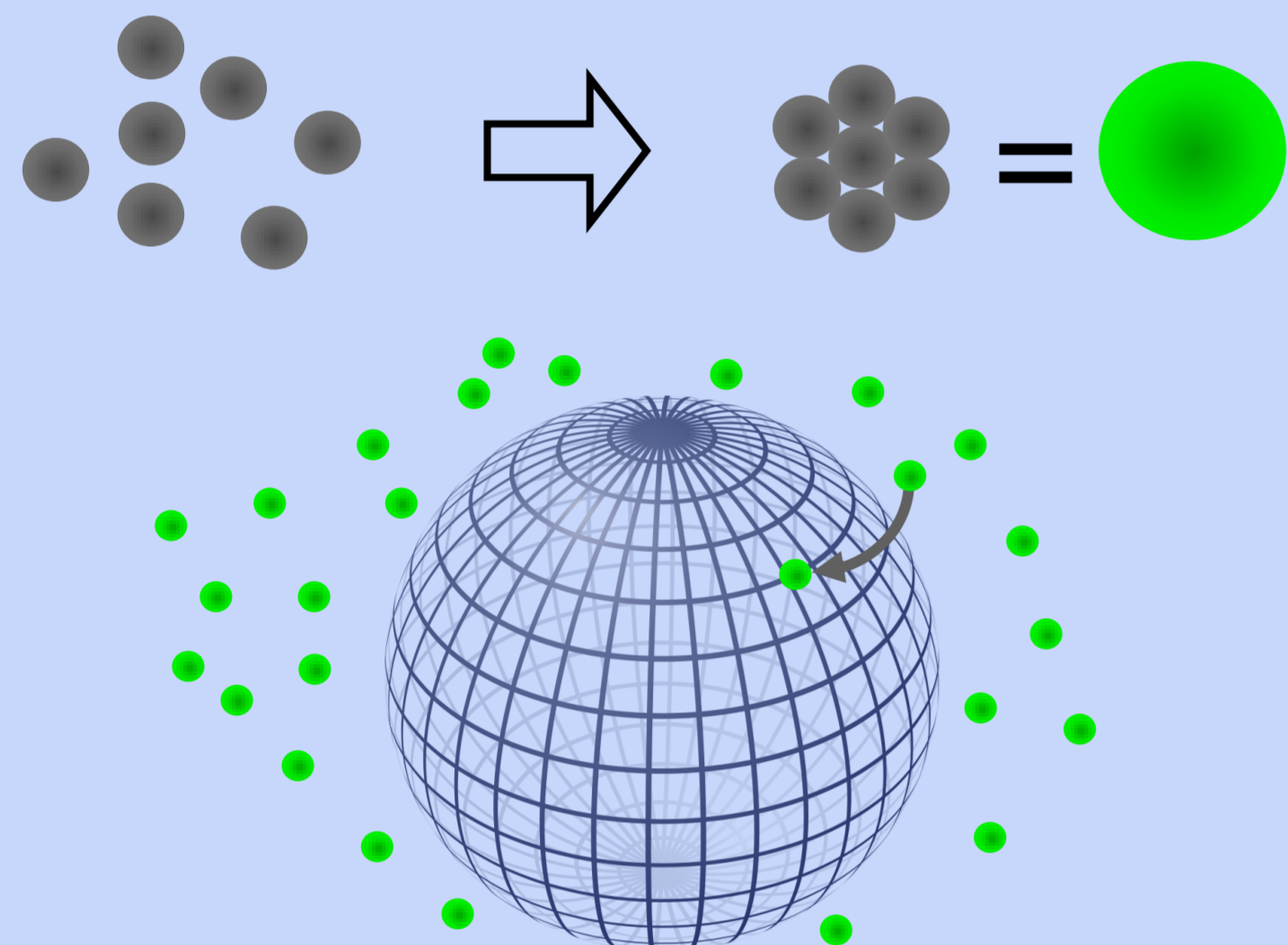


model

diffusion limited epitaxial aggregation on curved surfaces

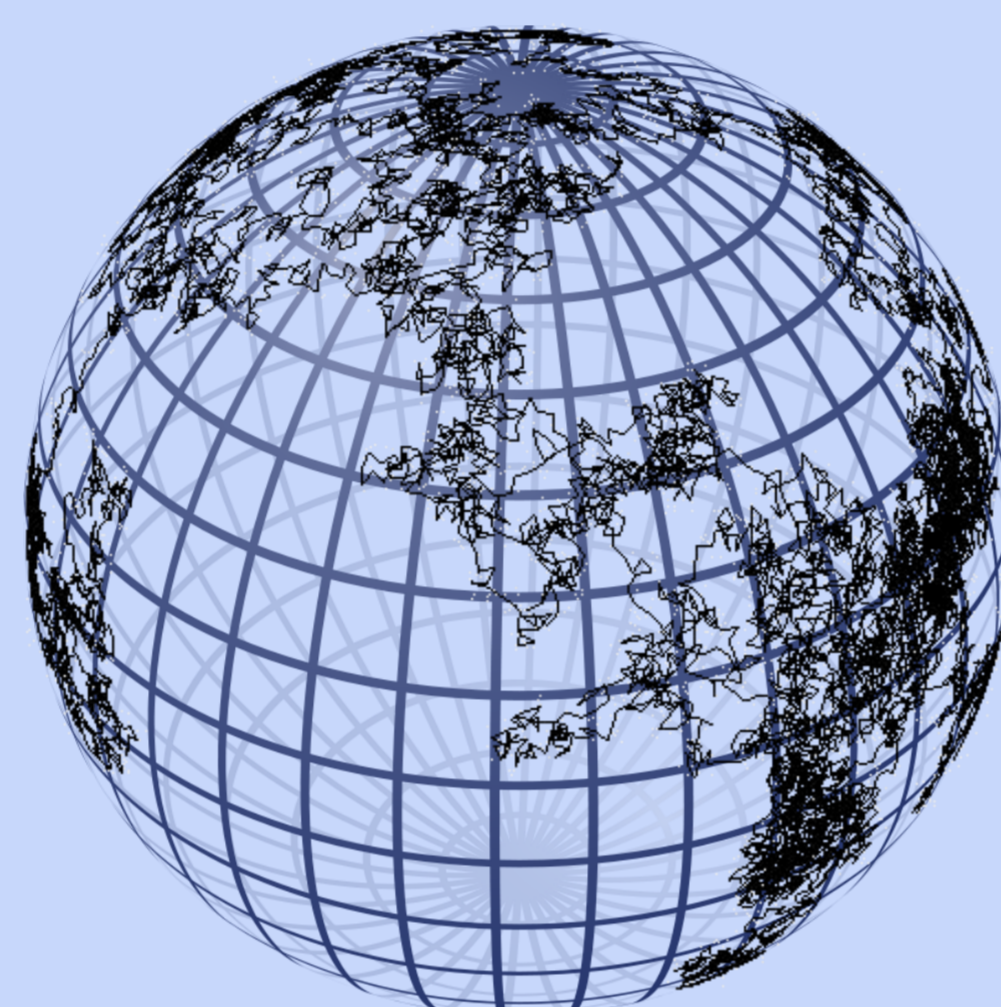
I: precipitation

- formation of clusters in the surrounding fluid phase
- clusters adhere to the surface of the core particle



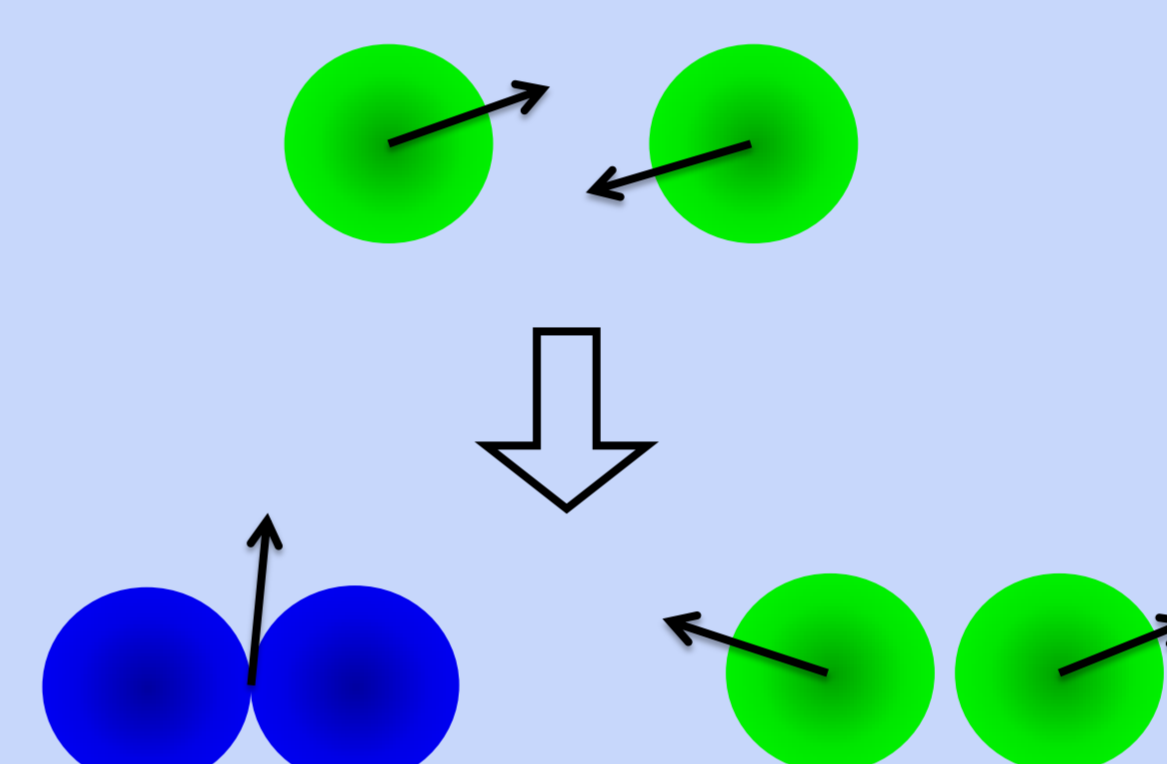
II: diffusion

clusters undergo Brownian motion on the curved surface of the core particle

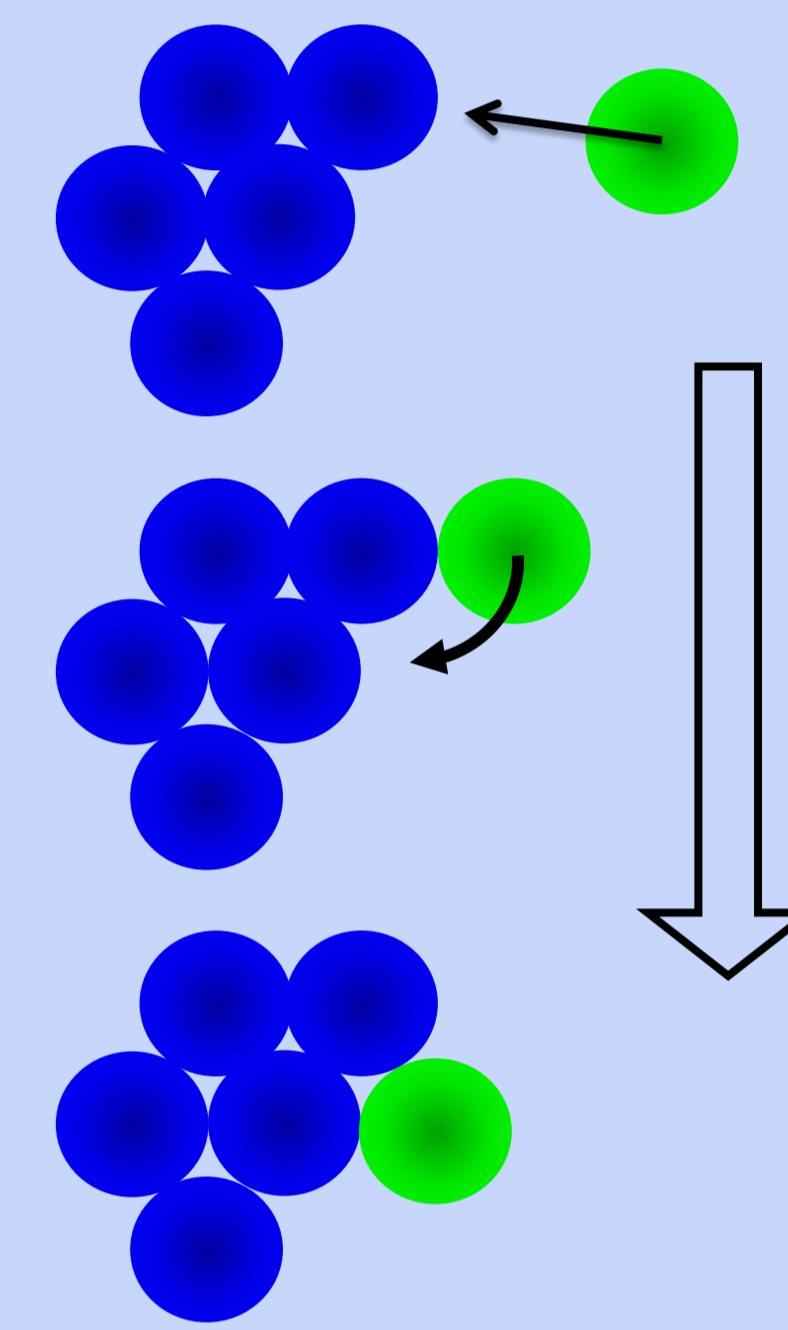


III: agglomeration

a) upon contact, clusters stick together with a certain probability



b) epitaxial growth: local relaxation of clusters

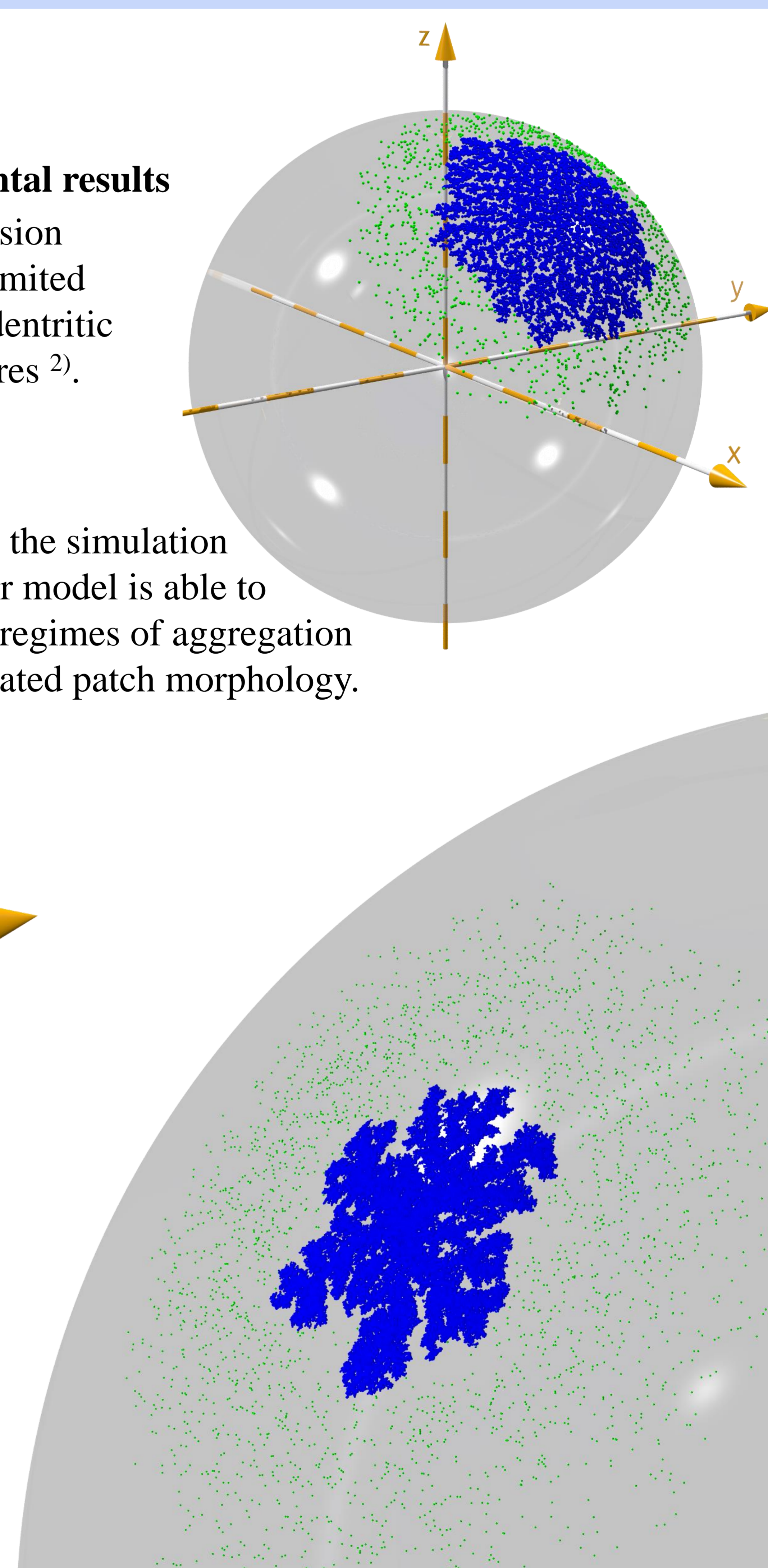
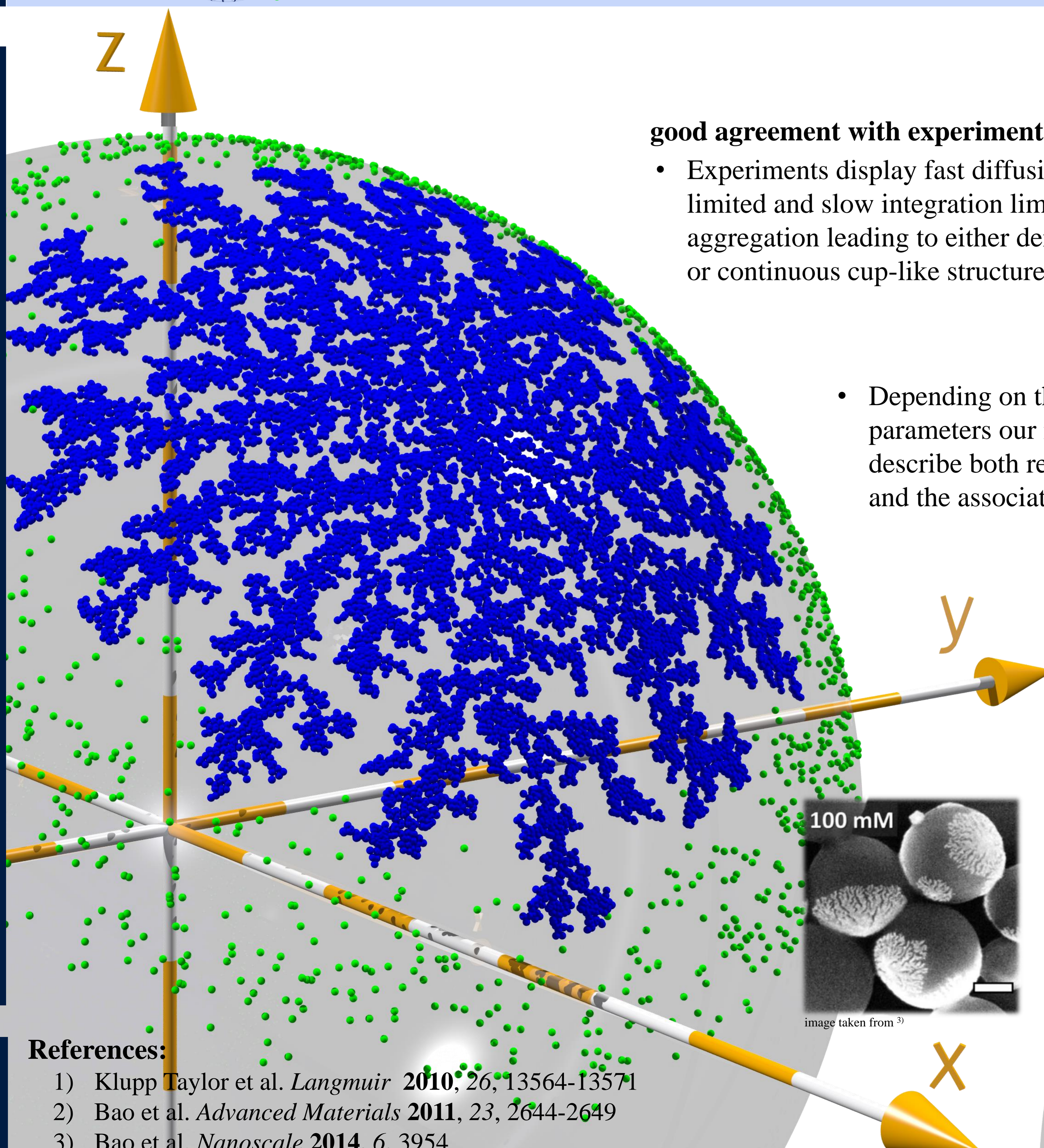


preliminary simulation results

good agreement with experimental results

- Experiments display fast diffusion limited and slow integration limited aggregation leading to either dendritic or continuous cup-like structures ²⁾.

- Depending on the simulation parameters our model is able to describe both regimes of aggregation and the associated patch morphology.



References:

- 1) Klupp Taylor et al. *Langmuir* **2010**, *26*, 13564-13571
- 2) Bao et al. *Advanced Materials* **2011**, *23*, 2644-2649
- 3) Bao et al. *Nanoscale* **2014**, *6*, 3954