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Study of the interactions of magnetosomes inside magnetotactic bacteria (MTB) through modeling and experimentation[1] JIAJIA DONG, Hamline University, ANDRÉ KÖRNIG, Max Planck Institute of Colloids and Interfaces, Department of Biomaterials, STEFAN KLUMPP, Max Planck Institute of Colloids and Interfaces, Department of Theory & Biosystems, DAMIEN FAIVRE, Max Planck Institute of Colloids and Interfaces, Department of Biomaterials —
Since the discovery in 1970s, magnetotactic bacteria (MTB) have enjoyed great interest to biomimetic and biophysical research, due to their fine-tuned synthesis of magnetosomes (magnetic nanocrystals enclosed in organelles) and challenges in understanding the precise mechanism of magnetotaxis via aligning the magnetosomes. We investigate magnetosomes inside an MTB cell as a chain of magnetic crystals and explore their internal interactions as well as the influence from an external magnetic field. Applying both analytical and simulation approaches, we are able to identify the threshold external magnetic field for effective magnetosome alignment depending on crystal configurations. The results agree well with high resolution X-ray diffraction data. They also provide a simple and quantitative model for elucidating the mechanical stability of the magnetosome chain, thus the energetically favorable states of MTB in the presence of an external magnetic field.

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Jiajia Dong
Hamline University

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