ELECTRONIC SUPPLEMENTARY INFORMATION
Microscopic modelling of nematic elastic constants beyond Straley theory

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1 Deformations and model particles

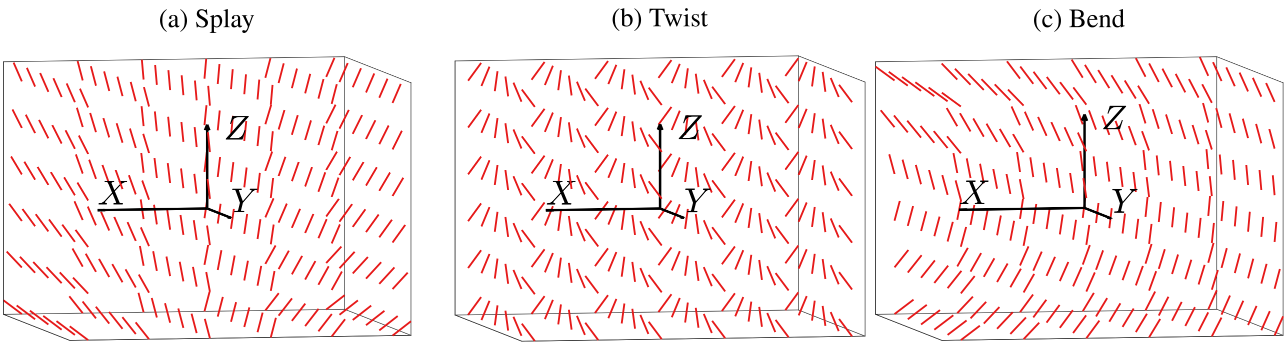


Figure S 1: Sketch of the director field (red) in presence of the three deformations defined in Eqs. (11-12) of the main text. $(OXYZ)$ is the laboratory reference frame.

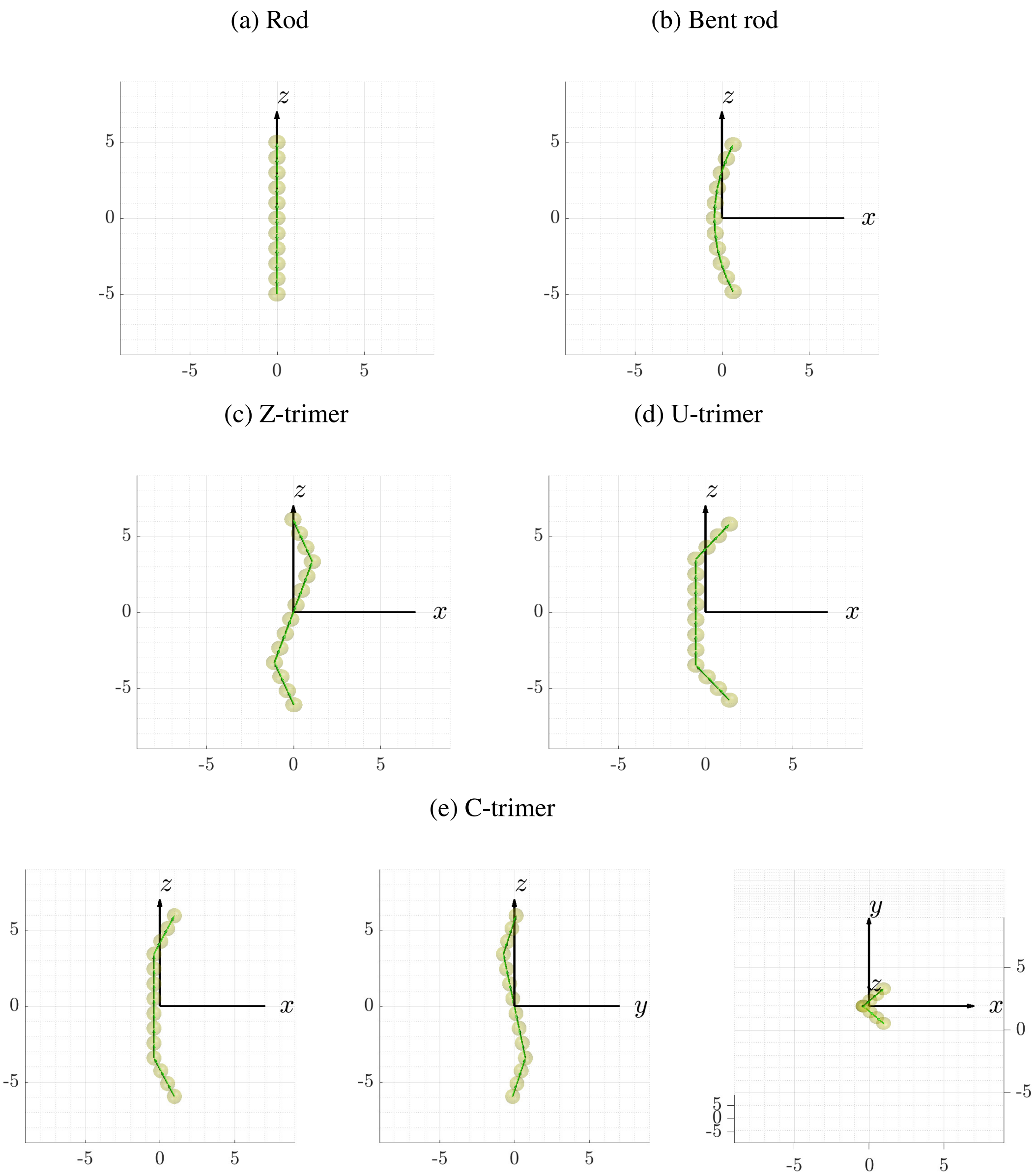


Figure S 2: Sketches of the particles studied in the present work.

2 Ideal and excess contributions to Frank elastic constants and plots of ODFs

2.1 Rod

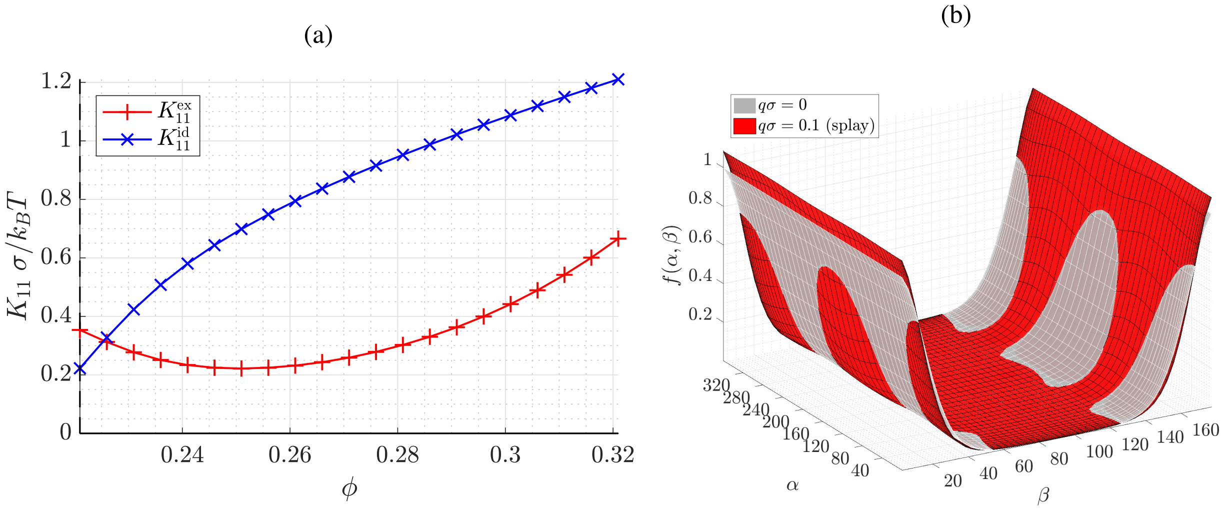


Figure S 3: (a) Contributions to the splay elastic constant, K_{11}^{id} and K_{11}^{ex}, for straight rods, as functions of the packing fraction ϕ. (b) ODF of rods in the uniform nematic phase (gray) and in the presence of a splay deformation (red), as defined in Eqs. (11-12) of the main text. Calculations with orienting strength parameter $a = 0.7$ and deformation wavenumber $q\sigma = 0.1$.

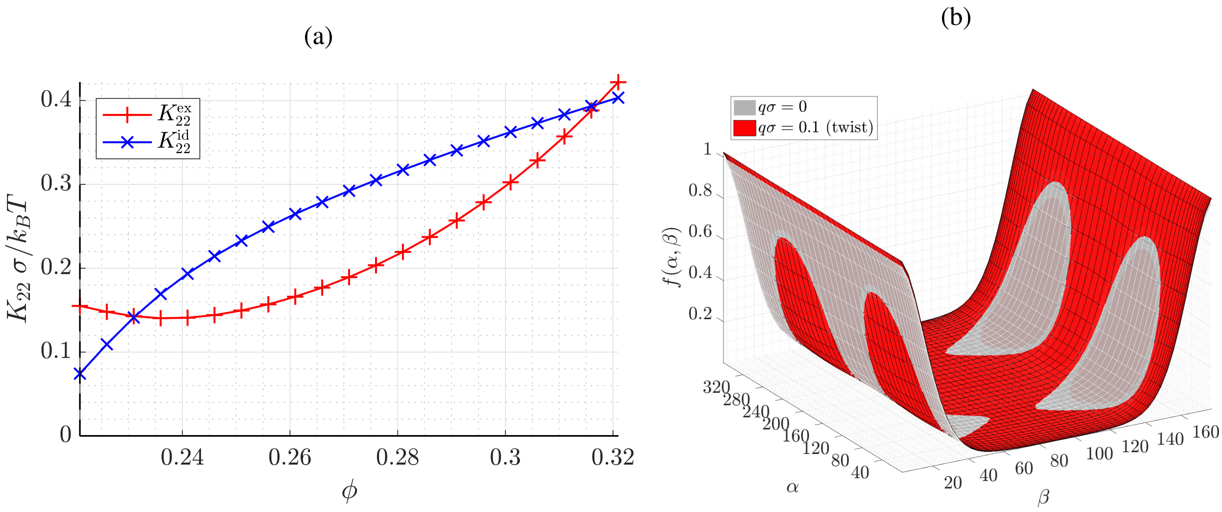


Figure S 4: (a) Contributions to the twist elastic constant, K_{22}^{id} and K_{22}^{ex}, for straight rods, as functions of the packing fraction ϕ. (b) ODF of rods in the uniform nematic phase (gray) and in the presence of a twist deformation (red), as defined in Eqs. (11-12) of the main text. Calculations with orienting strength parameter $a = 0.7$ and deformation wavenumber $q\sigma = 0.1$.

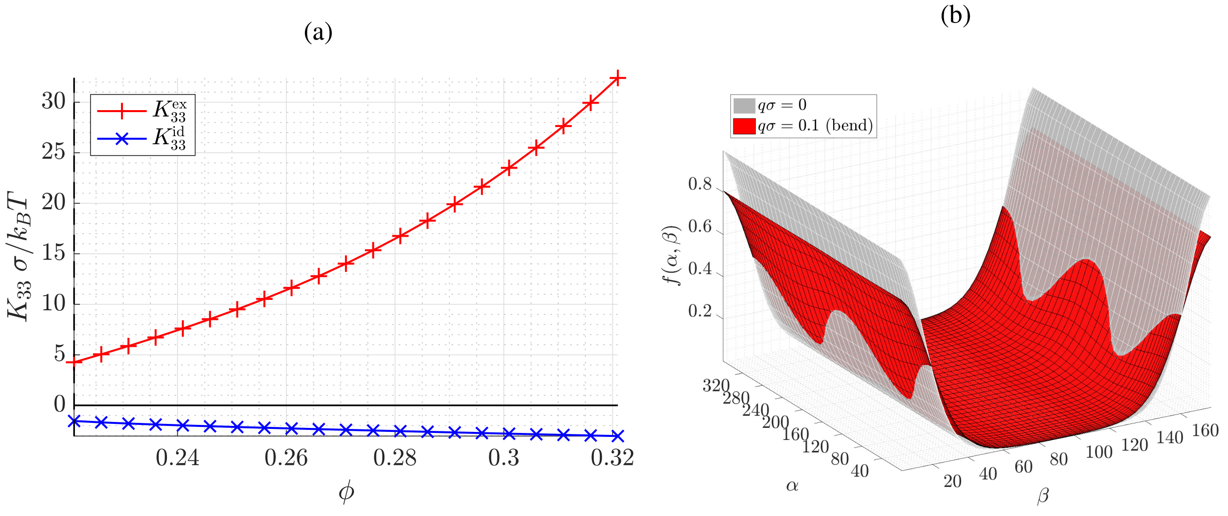
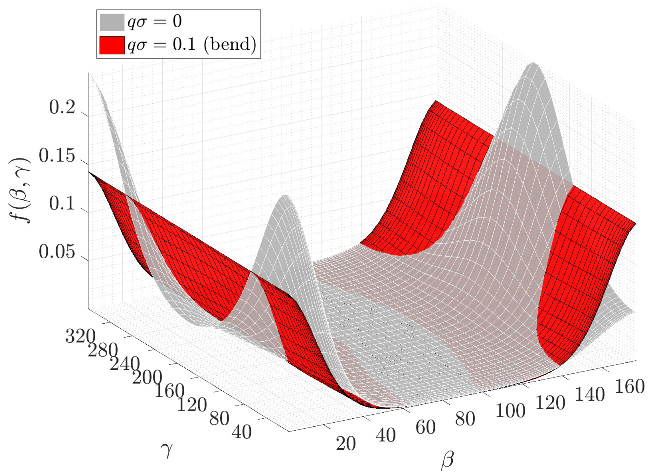


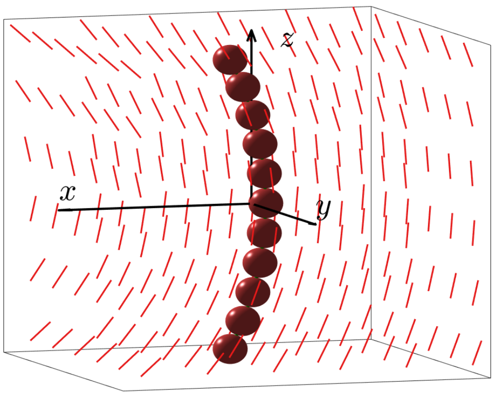
Figure S 5: (a) Contributions to the bend elastic constant, $K_{33}^{\rm id}$ and $K_{33}^{\rm ex}$, for straight rods, as functions of the packing fraction ϕ. (b) ODF of rods in the uniform nematic phase (gray) and in the presence of a bedn deformation (red), as defined in Eqs. (11-12) of the main text. Calculations with orienting strength parameter $a = 0.7$ and deformation wavenumber $q\sigma = 0.1$.

2.2 Bent Rod

(a) ODF plot ($\alpha = 0°$) for bent rods.



(b)



(c)

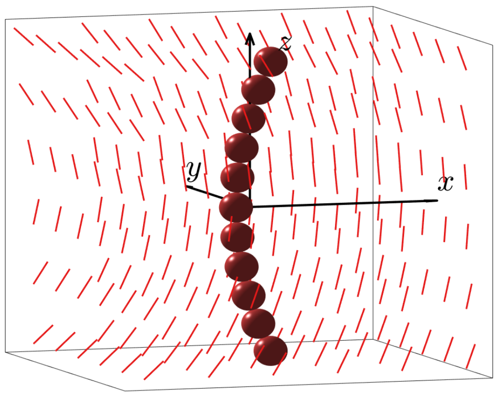


Figure S 6: (a) ODF of bent rods in the uniform nematic phase (gray) and in the presence of a bend deformation (red), as defined in Eqs. (11-12) of the main text. Calculations with orienting strength parameter $a = 0.7$, deformation wavenumber $q\sigma = 0.1$ and $\alpha = 0°$. The angles β and γ describe rotations around the molecular axes y and z, respectively. (b) Sketch of a bent rod immersed in a bent director field (red segments), in the orientation defined by the Euler angles $\alpha = 0°, \beta = 0°, \gamma = 0°$ (particle and distortion concavity in accordance), and (c) $\alpha = 0°, \beta = 0°, \gamma = 180°$ (particle and distortion concavity in opposition).

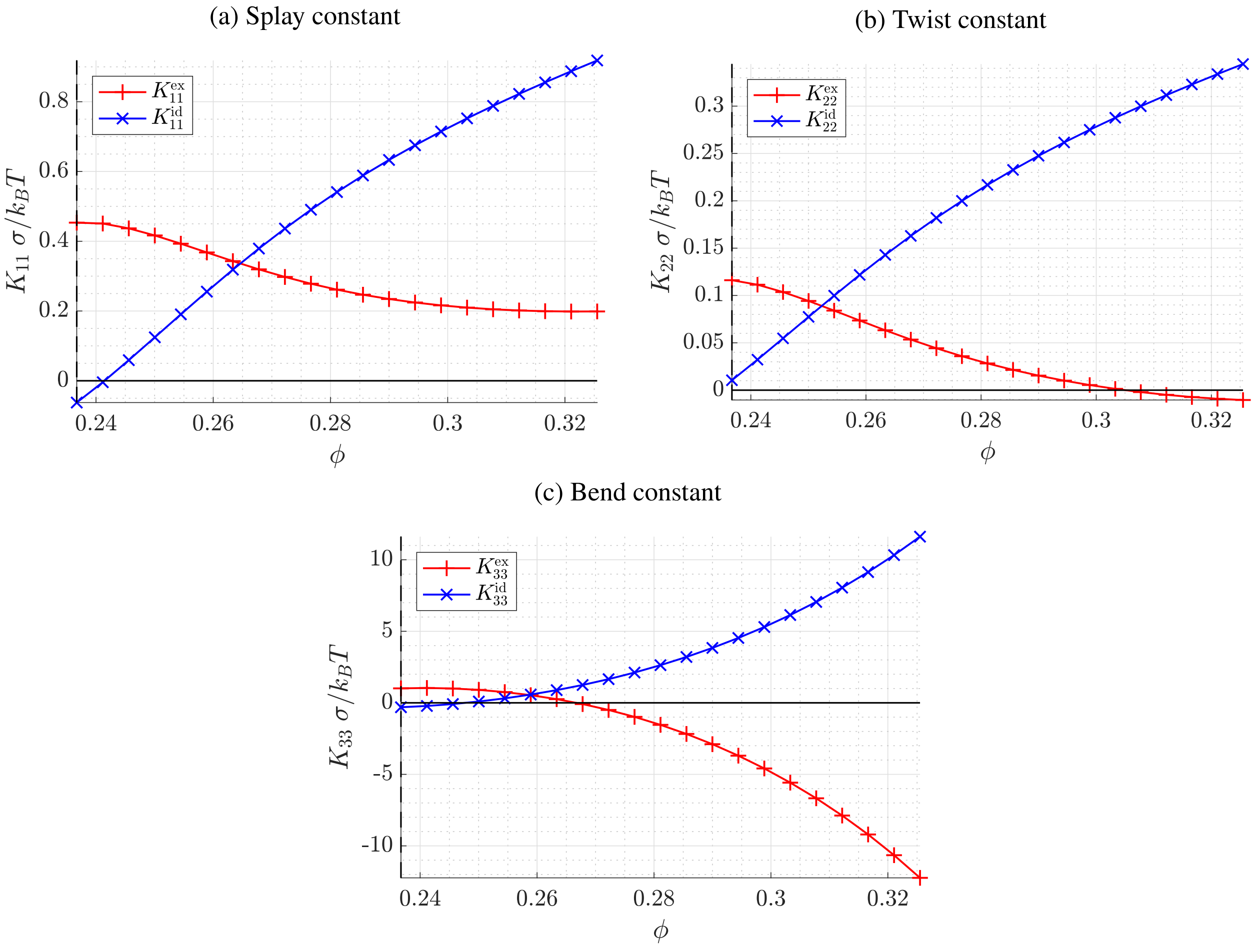


Figure S 7: Ideal and excess contributions to elastic constants for bent rod particles, as functions of the packing fraction ϕ.