Relations between Nematic Potential and Order Parameters $\langle P_2 \rangle$ and $\langle P_4 \rangle$

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The Maier-Saupe theory is employed in order to calculate order parameters $\langle P_2 \rangle$, $\langle P_4 \rangle$ from the nematic potential q. The relation between $\sigma = q/(RT)$ and $S = \langle P_2 \rangle$ corresponds well with a recently established formula by Kalmykov. The relation between the order parameters is in accordance with the analytic expression $\langle P_4 \rangle = 5/7 \, \langle P_2 \rangle^2$ proposed by Zanonni, but deviates significantly from the Faber model, according to which $\log \langle P_4 \rangle = (10/3) \log \langle P_2 \rangle$. Experimental results for 5 CB obtained from Raman measurements, however, are in better agreement with the Faber model.

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