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Abstract: We characterize the elastic contribution to the surface free energy of a nematic liquid crystal in the presence of a sawtooth substrate. Our findings are based on numerical minimization of the Landau-de Gennes model and analytical calculations on the Frank-Oseen theory. The nucleation of disclination lines (characterized by non-half-integer winding numbers) in the wedges and apexes of the substrate induces a leading order proportional to $q \ln q$ to the elastic contribution to the surface free-energy density, with q being the wave number associated with the substrate periodicity.

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