As the anchoring strength is lowered, the surface contribution becomes less dominant and the morphologies dominated by the surface are only found in the low chirality regime. The phase diagram for this anchoring regime is shown in figure 4.5B. For systems without chirality, the Bipolar phase becomes Uniaxial (U) and the two surface boojums disappear. The director field is oriented with a single axis as shown in (a). For low chiralities, the director field twists and forms the Twist Cylinder (TC) structure as shown in (b). The TC structure can be interpreted as an stack of layers, each with a λ^{+1} disclination. As we move away from the center in the x-direction, the director aligns with the cross section plane. The nature of this particular phase will be discussed in more detail later on.

For intermediate chirality ($N = 2, 3$) the resulting phases are precursors of a fully developed BPI. At low temperatures, we found the τ–Cholesteric phase (τ-Ch) that exhibits a single $\tau^{-1/2}$ defect across the bulk and a trefoil pattern on the surface, as pictured in (c). At higher temperatures, a single defect across the bulk becomes unstable and the formation of two u-shaped defects is observed in (d). The location and orientation of these line defects is similar to a defective joint from a BPII, however, the pitch values and temperature range of this occurrence are more fitting of a BPI phase by comparison to figure 4.5 and phase diagrams for bulk systems.

The next two phases are BPs. The stability region for the BPII is not altered, contrary to the BPI which is now stable for a wider interval of temperatures. However, a regular periodic structure in the bulk can only be perceived for temperatures near the isotropic transition. The defect lines at low temperatures show a tendency of tangling and knotting, thus any possible cells are extremely deformed.

4.1.3 Phase diagram: Prolate

As the droplet is deformed, pulling out by two extremes, the surface area is increased and some boundaries of the phase diagram are modified as φ increases. The phase diagrams for these geometries are shown in figure 4.6. In general, the configurations found are the same found in the droplet. However, some boundaries shift as the geometry changes.

For strong anchoring conditions, see figure 4.6A, the BPI phase is stabilized and the regions for the TwBS and RSS phases shrink as the geometry is more elongated. For the TwBs, the boojums are located in the extremes of the major axis of the spheroid as the director twists in the same helical fashion from the spherical case. The RSS morphology shows how the two surface defects attract each other towards the region with higher curvature. The surface-induced morphology is stable for lower temperatures, as we observe how a $\varphi = 1$ geometry exhibited the RSS structure and with $\varphi = 1.1$ the stable structure becomes a well-defined BPI in (e).

The destabilization of the droplet phases is more clear as the anchoring is weakened. The degradation of the phase from bipolar to uniaxial and from TwBs to TC, as in the droplet, is observed. The RSS structure ceases to appear in this range of temperature and instead the τ-Ch phase is present where the trefoil pattern covers the surface with parallel orientation regions that avoid the high curvature regions of the geometry. This phase is destabilized as φ increases and the BPI extends its range o stability. We observe that for low chirality the same precursor of BPI is present. The most interesting effect is presented in the region where BPII is usually found. As the domain is stretched, an apparent hybridization of BPs is observed, where the tetrahedral joints of defects are preserved and long disclination lines, typical of BPI fill the open spaces left without merging with any other defect. The hexagonal pattern on the surface is not altered.