FIG. 3. (Color online) [(a)–(h)] A series of frames extracted from a video and showing rotation of a dimer of SPMBs at an elevated temperature 33 °C, right below the nematic-isotropic phase transition temperature of 35 °C. Orientations of polarizer (P), rubbing direction (rub) defining orientation of n_0, analyzer (A), and the slow axis of a 530-nm wave plate (WP) are marked by double arrows.

surface, an important aspect in our studies. This tangential nondegenerate anchoring induces distortion of the nematic director field around the particle, creating two surface point defects called boojums [25–28,30–33], which are seen clearly under POM [Fig. 2(b)] at the poles of the particle along the far-field director and are schematically depicted using hemispheres in Figs. 2(c) and 2(d) for individual particles and in Figs. 2(e) and 2(f) for colloidal assemblies. In the two-dimensional director field at the interface of NLC and a single spherical SPMB, n_s, the two boojums are singular defects that each have winding number $+1$ in n_s, consistent

By locally melting the LC around a colloidal dimer to an isotropic state, magnetically aligning $\mathbf{n}_{cc}$ in different orientations, then quenching the sample back to the nematic phase in presence of magnetic field forcing the dimer to retain this orientation with respect to confining surface rubbing direction during the quench, and, finally, turning the magnetic field off, we explored metastable states that can be obtained for such dimers due to the anchoring memory affects. We found that, in addition to the ground-state configuration with $\mathbf{n}_{cc}$ oriented along a 30° cone with respect to $\mathbf{n}_0$ that are similar to those formed by particles with tangentially degenerate anchoring [32,33], there are also several metastable dimer orientations, including the ones with $\mathbf{n}_{cc}$

FIG. 9. (Color online) Boojum angular motion with respect to the corresponding SPMBÕs center of mass at room temperature. Inset image in (a)Ð(d) indicates the SPMBs boojum that is tracked for a total of four plots. Each line indicates a different angular frequency of magnetic Þeld and dimer rotations: 0.01 Hz (black), 0.02 Hz [red (dark gray)], and 0.05 Hz [green (light gray)]. Note that boojum slipping frequency and amplitude are both dependent on the rotation rate. A representative instance of boojum stick-slip is called out with a black arrow in (a). The thin lines interrupting the dependencies in graphs correspond to the time intervals of rotation when the boojums cannot be localized within the neck regions.

at boojumÕs$_{bb}$ deßection to ± 30° from n_0. This makes sense from the standpoint of elastic distortion of the local director Þeld. As the dimer rotates, elastic free energy of the surrounding structure increases due to elastic deformation of the director. Surface anchoring and easy axis pinning on the SPMB surface withstand this elastic distortion to a point, at which the system is forced to reminimize its elastic and surface anchoring free energy through relocating the boojums, changing n_s

FIG. 10. (Color online) Boojum angular motion with respect to its SPMBÕs center of mass at an elevated temperature of 33.5 °C. The inset image in (a)Ð(d) indicates the tracked boojums on a colloidal dimer for a total of four plots. Each line corresponds to a different angular frequency of dimer rotation: 0.01 Hz (black), 0.02 Hz [red (dark gray)], and 0.05 Hz [green (light gray)]. The comparison of these data shows that boojum slipping period and amplitude are dependent on the rotation rate and temperature. A representative instance of boojum stick-slip is called out with a black arrow in (a).

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