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Swarming of active colloidal Janus particles: Polar waves and vortices CONG XU, JING YAN[1], University of Illinois at Urbana-Champaign, MING HAN, ERIK LUIJTEN, Northwestern University, STEVE GRANICK, University of Illinois at Urbana-Champaign — The synthesis of artificial "swarming" particles with tunable interaction represents a strong interest of the soft active matter community. Here, we demonstrate a straightforward design of swarming Janus colloids that exhibit transient mutual alignment within a certain frequency range of an applied AC electric field. In a dense two-dimensional suspension of these Janus colloids, we observe that coherent polar waves emerge at first, which then collide and merge into stable discrete vortices. Based upon a careful analysis of the pair interaction, we propose a simple mechanism that explains the formation of the polar waves, with agreement between experiment and simulation. A rich spectrum of phenomena, including dimer swarming, chain formation, and particle clustering, can be further achieved by changing the frequency of the AC electric field.

[1]Currently working as a postdoctoral researcher in Princeton University.

Cong Xu
University of Illinois at Urbana-Champaign

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