Abstract Submitted for the MAR14 Meeting of The American Physical Society

Aggregation and segregation of confined self-propelled particles¹ XINGBO YANG, M. LISA MANNING, M. CRISTINA MARCHETTI, Department of Physics, Syracuse University, Syracuse NY 13244 — We study the effect of confinement on a collection of self-propelled (SP) disks in two dimensions, interacting solely via soft elastic repulsion. Individual SP particles perform persistent random walks characterized by the self-propulsion speed v_0 and the rotational diffusion rate. In a single component system, we observe spontaneous aggregation of particles at the walls at low packing fraction when their persistence length is smaller than the system size. Above the packing fraction where jamming occurs in passive disks, collective effects become important and a finite v_0 is needed for aggregation. The pressure on the wall shows a non-monotonic dependence on packing fraction: a linear growth consistent with ideal gas behavior at small packing fraction and a decrease at large packing fraction. In a bidisperse system of disks with radii ratio 1: 1.4 we find spontaneous species segregation. This arises from the interplay of self propulsion and the asymmetry in the elastic energy barriers seen by different-sized particles during collisions.

 $^1\mathrm{XY}$ and MCM were supported by the NSF on awards DMR-1004789 and DGE-1068780.

Xingbo Yang Department of Physics, Syracuse University, Syracuse NY 13244

Date submitted: 13 Nov 2013

Electronic form version 1.4