



CW

## Frustrated antiferrotoroid

In this pentagonal lattice, paramagnetic colloids (black disks, 10  $\mu\text{m}$  diameter) are arranged in topographic double wells having a spin degree of freedom. By increasing the interparticle interaction, the system rearranges to minimize their energy in a chiral order. Pentagons prefer either a clockwise (CW-blue) order or an anticlockwise (CCW-red) one. However, mapping the entire space with red and blue pentagons is impossible due to geometric frustration. The resulting strongly coupled state remains disordered and, due to frustration, massively degenerate. It corresponds to a frustrated antiferrotoroid.

CCW



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