Lattice melting and surface Topological order in 3D Time reversal invariant topological superconductor YIZHI YOU, KITP — In this talk, we start from the eight copies of 3D Time reversal invariant topological superconductor on a crystal. By proliferating and condensing the disclinations, we can therefore restore the spatial rotation symmetry of the lattice crystal. During the procedure of lattice melting, the fermion acquires a $\pi$ Berry Phase when winding around the $2\pi$ disinclination and therefore the fermions get confined when disclination loop proliferates. After the disclination condensed, we obtained a 3D bosonic SPT phase with by $T$ and spatial rotation symmetry. In addition, we investigate the surface state of this Bosonic SPT. If we break the $T$ symmetry on the surface, the 8 majorana cones are gapped and the $2\pi$ disclination has semion statistics. To obtain a $T$ and rotation invariant gapped surface state, we first turn on Fulde-Ferrell superfluid order of the surface to gap the surface fermion and then condensed the vortex/disclination of the superfluid to restore the $T$ and rotation symmetry. The disclination dipole and vortex exhibit fractional statistics and therefore vortex condensation and lattice melting give rise to new surface topological order.

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