

Many-body localization generalizes the concept of Anderson localization (i.e. single particle localization) to isolated interacting systems, where many-body eigenstates in the presence of sufficiently strong disorder can be localized in a region of Hilbert space even at nonzero temperature. This is an example of ergodicity breaking, which manifests failure of thermalization or more specifically the break down of eigenstate-thermalization hypothesis. In this talk, I enquire into the quasi many-body localization in topologically ordered states of matter, revolving around the case of Kitaev toric code on the ladder geometry, where different types of anyonic defects carry different masses induced by environmental errors. Our study verifies that the presence of anyons generates a complex energy landscape solely through braiding statistics, which suffices to suppress the diffusion of defects in such clean, multicomponent anyonic liquid. This nonergodic dynamics suggests a promising scenario for investigation of quasi many-body localization. Our results unveil how self-generated disorder ameliorates the vulnerability of topological order away from equilibrium. This setting provides a new platform which paves the way toward impeding logical errors by self-localization of anyons in a generic, high energy state, originated exclusively in their exotic statistics.