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Unification and Composite Asymmetric Dark Matter

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Asymmetric dark matter is one of alternative framework of dark matter to the weakly interacting massive particle framework, where its relic abundance is determined by the particle-antiparticle asymmetry. Once the dark matter asymmetry is originated from the same mechanism as the baryon asymmetry, the dark matter mass is predicted to be of GeV. Compositeness of asymmetric dark matter plays significant roles in inducing strong depletion of symmetric component of particle and antiparticle. Dimensional transmutation would provide a natural explanation of the dark matter mass in GeV, but it still remains a question why the gauge dynamics in the dark sector has confined at the similar scale as QCD. Considering a unification structure and mirror parity between the SM sector and dark sector, we provide an ultraviolet completion for the composite asymmetric dark matter framework. The unification framework provides key ingredients for the composite asymmetric dark matter, such as confinement in the dark sector similar to the QCD scale, a portal interaction sharing the generated asymmetry, and a portal interaction releasing enormous entropy in the dark sector. I also discuss the phenomenological consequence of this framework.

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