abstract We reanalyze the photoevaporation problem of subgalactic objects irradiated by ultraviolet background (UVB) radiation in a reionized universe. For the purpose, we perform three-dimensional radiation smoothed-particle-hydrodynamics (RSPH) calculations, where the radiative transfer is solved by a direct method and also the non-equilibrium chemistry of primordial gas including H$_2$ molecules is incorporated. Attention is concentrated on radiative transfer effects against UVB for the formation of subgalactic objects with $T_{\text{vir}} \approx 10^4$ K. We consider the reionization model with $z_{\text{reion}} \approx 7$ and also the earlier reionization model ($z_{\text{reion}} \approx 17$) inferred by the WMAP. We find that the star formation is suppressed appreciably by UVB, but baryons at high-density peaks are self-shielded even during the reionization, forming some amount of stars eventually. In that sense, the photoevaporation for subgalactic systems is not so perfect as argued by one-dimensional spherical calculations. The final stellar fraction depends on the collapse epoch and the mass of system, but almost regardless of the reionization epoch. For instance, a few tenths of formed stars are born after the cosmic reionization in $z_{\text{reion}} \approx 7$ model, while more than 90% stars are born after the reionization in the WMAP reionization model. Thus, effects of UVB feedback on the substructure problem with a cold dark matter (CDM) scenario should be evaluated with careful treatment of the radiative transfer.

The star clusters formed at high-density peaks coalesce with each other in a dissipationless fashion in a dark matter potential, resultant forming a spheroidal system. As a result, these low-mass galaxies have large mass-to-light ratios such as observed in dwarf spheroidals (dSph’s) in the Local Group.