Domain walls in early universe

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We study the evolution of thick domain walls in the inflationary universe with quadratic inflaton potential $m^2\Phi^2/2$, as well as in the matter-dominated and radiation-dominated universe, or more generally in the universe with the equation of state $p = w\rho$. We have found that the domain wall evolution crucially depends on the time-dependent parameter $C(t) = 1/(H(t)\delta_0)^2$, where $H(t)$ is the Hubble parameter and δ_0 is the width of the wall in flat space-time. For $C(t) > 2$ the physical width of the wall, $a(t)\delta(t)$, tends with time to constant value δ_0, which is microscopically small. Otherwise, when $C(t) \leq 2$, the wall steadily expands and can grow up to a cosmologically large size.

We also present a model of spontaneous (or dynamical) C and CP violation where it is possible to generate domains of matter and antimatter separated by cosmologically large distances. Such $C(CP)$ violation existed only in the early universe and later it disappeared with the only trace of generated baryonic and/or antibaryonic domains. So the problem of domain walls in this model does not exist. These features are achieved through a postulated form of interaction between inflaton and a new scalar field, realizing short time $C(CP)$ violation.