We investigate the three dimensional nonlinear sigma models with $\mathcal{N} = 2$ supersymmetry in the framework of Wilsonian renormalization group.

In this work, we rewrite the Wilsonian renormalization group equation of the three dimensional nonlinear sigma models to the covariant form and construct the three dimensional conformal sigma models as the fixed pint theory of the Wilsonian renormalization group equation. The conformal sigma models constructed in this approach have one free parameter, c, which arises from the field rescaling effects, and we show that the parameter is the conformal dimension of the scalar field. When $c = 0$, the Wilsonian renormalization group equation of the fixed point has an extremely simple form, we find that the target manifold of the fixed point theory must satisfy the Kähler-Einstein condition with specific value of the radius. When $0 < c < 1/2$, since it is difficult to solve the Wilsonian renormalization group equation of the fixed point in general, we consider the real two dimensional target manifold and solve the fixed point equation by using a numerical method. We find that the target manifold of the fixed point theory becomes the "deformed sphere". On the other hand, for $c \geq 1/2$, we find that the target manifold is non-compact. At the critical value $c = 1/2$, the target manifold reduces to a flat space corresponding to a free field theory. Furthermore, we investigate the flows around the fixed points which have a compact hermitian symmetric space as a target manifold. We derive the linearized Wilsonian renormalization group equation for the deviation from the fixed point metric, and solve it by using the harmonic expansion on G/H. We find that the CP^{N-1} fixed point has the one relevant mode which corresponds to the radius of CP^{N-1}.