ABSTRACT

A nonvolatile semiconductor memory element enabling to improve insulation performance of an insulator around a floating gate and to decrease the ratio of oxidized metal ultrafine particles in the floating gate, are provided.

In a process for producing nonvolatile semiconductor memory element comprising a floating gate made of a hardly oxidizable material having a Gibbs' formation free energy for forming its oxide higher than that of Si in a range of from 0°C to 1,200°C, and an insulator made of an oxide of an easily oxidizable material surrounding the floating gate and having such an energy equivalent or lower than that of Si, the floating gate made of hardly oxidizable material is formed by using a physical forming method, the oxide of the easily oxidizable material is formed by using a physical forming method or a chemical forming method, and after a gate insulation film is formed, a heat treatment is carried out in a mixed atmosphere of an oxidizing gas and a reducing gas in a temperature range of from 0°C to 1,200°C while the mixture ratio of the mixed gas and the temperature are controlled so that only the hardly oxidizable material is reduced and only the oxide of the easily oxidizable material is oxidized.