Many processes, which involve phase transition, happen at non-equilibrium conditions. This leads to a complicated structure of, for instance, the temperature profile across the interface between two phases. In contrast to an equilibrium transition, when the temperature is constant throughout the interface, in non-equilibrium the temperature changes from a gas value to a liquid value in a non-monotonous manner. The rate of nucleation depends on the rate of heat and mass transfer from an old phase to a new phase across the surface of nuclei. The curvature of the nucleus interface changes in time. Therefore, the knowledge of how the interfacial heat and mass transfer coefficients depend on the curvature is important for the correct description of the nucleation process. The square gradient model of the interface, which considers the gradients of the density as additional thermodynamic variables, was successfully used to describe equilibrium properties of the interface between two coexisting phases. Recently [Glavatskiy and Bedeaux, PRE 77, 061101 (2008), PRE 79, 031608 (2009)] we extended it to planar surfaces in non-equilibrium. This allowed us to calculate the profiles of the temperature and the chemical potentials across the interfacial region as well as the interfacial resistances to heat and mass transfer. In this work, we extend the non-equilibrium square gradient model to curved interfaces. We study how the curvature of the interface affects the distribution of the temperature and the chemical potential as well as the interfacial resistance to heat and mass transfer.