COLIBABA, G.V. Novel approach for calculating the charge carrier mobility and Hall factor for semiconductor materials. In: Journal of Physics and Chemistry of Solids. 2018, Vol.117, pp. 76 - 80. ISSN 0022-3697.

The additive Matthiessen's rule is the simplest and most widely used rule for the rapid experimental characterization and modeling of the charge carrier mobility. However, the error when using this rule can be higher than 40% and the contribution of the assumed additional scattering channels due to the difference between the experimental data and results calculated based on this rule can be misestimated by several times. In this study, a universal semi-additive equation is proposed for the total mobility and Hall factor, which is applicable to any quantity of scattering mechanisms, where it considers the energy dependence of the relaxation time and the error is 10–20 times lower compared with Matthiessen's rule. Calculations with accuracy of 99% are demonstrated for materials with polar-optical phonon, acoustic phonon via the piezoelectric potential, ionized, and neutral impurity scattering. The proposed method is extended to the deformation potential, dislocation, localized defect, alloy potential, and dipole scattering, for nondegenerate and partially degenerate materials.