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We present a micro-scale model of binary fluid mixture at the molecular level. First we developed the model for single component. Here we extend the model to the two component mixture. In this model, we assumed the binary mixture as a single component mixture, in order to reduce the number of dimension and quantity of the parameter. In this study, we developed a new computational algorithm for solving the convection-diffusion equations of the combination of the traditional Fick's first law and the Schmidt law, in the presence of nanoparticles. Based on the algorithm, we solved the equations for the combination of the traditional Fick's first law and the Schmidt law, in the presence of nanoparticles, using a computational grid of finite volume method and the finite volume method. We solved the equations on the basis of the finite volume method. To confirm the accuracy of the proposed algorithm, we compared the numerical solutions with a well-established finite difference method. Also, the numerical solutions were compared with the exact analytical solutions of the simple convection-diffusion equations. We present the electronic structures of (Si{sub 3} Ge{sub 4}){sub 2}Sb and (Si{sub 3} Sn{sub 4}){sub 2}Sb alloys by density functional theory (DFT) calculations, and evaluate the possibility of controlling electronic properties by alloying. The density functional theory calculations show that (Si{sub 3} Ge{sub 4}){sub 2}Sb and (Si{sub 3} Sn{sub 4}){sub 2}Sb alloys have many narrow band gap semiconducting properties, and that (Si{sub 3} Sn{sub 4}){sub 2}Sb has a very high optical absorption coefficient. The purpose of this study is to compare the conductivity of filled and unfilled polymer composites. In the first part of the paper we review some of the approaches which are currently available to calculate the electrical conductivity of such composites. In the second part, we present a new model of polymer composites which is based on the de Gennes conductivity model. In this model, we consider each polymer particle as a sphere, and each sphere is surrounded by an infinitely conducting spherical shell. The conductivity of the system is the sum of the conductivities of the individual spheres. Our new model allows us to calculate the electrical conductivity of polymer composites, for various volume fractions and for a wide range of 82157476af