Abstract： Experimental results show that much more charge injection occurs from nanocarbon black loaded ethylene-vinyl acetate copolymer semiconductor electrode (semiconductor electrode for short) into polyethylene (PE) than that from metal electrodes, which cannot be well explained from the existing viewpoints. To explain it, the difference in interface electrical contact between the semiconductor electrode/PE and metal electrode/PE is emphasized. The interface electrical field of the semiconductor electrode with PE is quasi-quantitatively evaluated, based on a proposed model electrode composed of orderly arranged conductive spheres and ideal filling dielectric, whose interface electrical field was calculated by the finite element method. The calculation results show that the field strength near the top of the conductive spheres is much higher than the uniform strength between two ideal plane electrodes, depending on the filling rate and the size of the conductive spheres. A high filling rate of the conductive spheres is favorable to decrease the maximum interface field, and the strong field range can be effectively reduced by decreasing the size of the conductive spheres. The simulation results give a qualitative satisfactory explanation of the much more charge injection for the sample with the semiconductor electrode than those for the samples with metal electrodes from the point of view of the interface electric field