In direct current (DC), during the operation of the cables, in their insulations, as well as in those of the joints (the least reliable equipment of the cable lines) a volume space charge ρ_v accumulates. Moreover, in the multi-layer insulations of the joints (XLPE / EPDM, XLPE / EPR etc.), at the interfaces between the layers, a surface space charge ρ_s also accumulates. The space charge generates an additional electric field that overlaps the one corresponding to the operating voltage, leading to the local intensification of the electric field *E* in insulation, contributing to the continuous ageing and to the reduction of their lifetimes. Given the influence of space charge on the degradation of insulation, lately special attention is paid to reducing its level. In this sense, materials with low ρ_v and technologies for making joints with insulation that have low values of ρ_s are sought. The objectives of the thesis were to study the accumulation of space charge and determine its distribution in the insulation of power cable joints, study the effects of space charge (resulting electrical stresses), under the action of various electrical and thermal stresses and determine methods to reduce space charge. In support of these objectives, four hypotheses were investigated, all of which were subsequently confirmed. Measurements were performed on flat and cylindrical samples (XLPE, EPR, EPDM, XLPE / EPR, XLPE / EPDM), uni-layered and multi-layered, unaged and thermally aged up to 90 days at 120 °C. The interface shape of the multi-layer flat samples was studied by optical and electron scanning microscopy and the effects of thermal aging were determined by FTIR measurements. The values of the electrical properties of the components of the multi-layer insulation of a DC joint were measured (electrical conductivity σ and permittivity ε and ρ_v) as well as the variations of these properties with different measurement parameters (measurement duration *t*, measurement temperature *T*, applied voltage) and with accelerated thermal ageing duration. A new empirical relation has been proposed for the calculation of σ according to the values of *T* and *E* which allows obtaining values closer to those determined experimentally compared to other expressions. The distribution of *E* in flat, cylindrical two-layer structures and in a joint model was determined numerically, in which the influence of a material with *E*-dependent electrical conductivity (FGM material) was considered. A higher number of residual products for EPR was shown, followed by EPDM, compared to XLPE. The increase of the ageing duration determines an increase of σ values for all samples (more for EPR) and an increase of ε values for EPR samples and a decrease of them for EPDM and XLPE. In all samples ρ_v was separated and, in the case of multi-layered samples, also ρ_s. The highest values of ρ_v for uni-layered samples are obtained in EPR samples, followed by EPDM and XLPE. The accumulation of space charge leads to the local intensification of *E* in all samples and, after the cancellation of the voltage, it does not disappear, but a non-zero residual electric field remains. The incorporation of a FGM material in the DC joints leads to a lower accumulation of space charge at the interfaces between the insulating layers and, in general, leads to lower values of *E*. From the analysis of all results, it results that between EPR and EPDM, for cable joints insulations it would be preferable to use EPDM, but the purity of the base materials and the manufacturing technology must be improved.

In curent continuu (CC), in timpul functionarii cablurilor, in izolatiile acestora, ca si in acelea ale jonctiunilor (echipamentele cele mai putin fiabile ale liniilor de cablu) se acumuleaza sarcina spatiala volumica ρ_v. Mai mult, in izolatiile multistrat ale jonctiunilor (XLPE / EPDM, XLPE / EPR etc.), la interfetele dintre straturi, se acumuleaza si sarcina spatiala de suprafata ρ_s. Sarcina spatiala genereaza un camp electric suplimentar care se suprapune peste cel corespunzator tensiunii de functionare, conducand la intensificarea locala a campului electric *E* in izolatii, contribuind la imbatranirea continua si la reducerea duratelor de viata ale acestora. Avand in vedere influenta sarcinii spatiale asupra degradarii izolatiilor, in ultimul timp se da o atentie deosebita reducerii nivelului acesteia. In acest sens se cauta, atat materiale cu ρ_v, cat si tehnologii de realizare a jonctiunilor cu izolatii care sa prezinte valori reduse ale lui ρ_s. Obiectivele tezei au fost studiul acumularii sarcinii spatiale si determinarea repartitiei ei in izolatiile jonctiunilor cablurilor de energie, studiul efectelor sarcinii spatiale (a solicitarilor electrice rezultate), sub actiunea diferitelor solicitari electrice si termice si determinarea de metode pentru reducerea sarcinii spatiale. In sprijinul acestor obiective s-au investigat patru ipoteze, ce au fost toate ulterior confirmate. S-au efectuat masuratori pe esantioane (XLPE, EPR, EPDM, XLPE / EPR, XLPE / EPDM) plane si cilindrice, unistrat si multistrat, neimbatranite si imbatranite termic pana la 90 de zile la 120 °C. S-a studiat forma interfetei esantioanelor plane multi-strat prin microscopie optica si de baleaj electronic si s-au determinat efectele imbatranirii termice prin masuratori FTIR. S-au masurat valorile proprietatilor electrice ale componentelor izolatiei multistrat a unei jonctiuni de CC (conductivitatea σ si permitivitatea ε electrica si ρ_v) precum si variatiile acestor proprietati cu diferiti parametri de masura (durata de masura *t*, temperatura de masura *T*, tensiunea aplicata) si cu durata de imbatranire termica accelerata. S-a propus o noua relatie empirica pentru calculul lui σ in functie de valorile lui *T* si *E* ce permite obtinerea unor valori mai apropiate de cele determinate experimental fata de alte expresii. S-a determinat numeric repartitia lui *E* in structuri bi-strat plane, cilindrice si intr-un model de jonctiune, in care s-a considerat influenta unui material cu conductivitate electrica dependenta de *E* (material FGM). S-a aratat prezenta unui numar mai ridicat de produsi reziduali pentru EPR, urmat de EPDM, fata de XLPE. Cresterea duratei de imbatranire determina o crestere a valorilor lui σ pentru toate esantioanele (mai mult pentru EPR) si o crestere a valorilor lui ε pentru esantioanele de tip EPR si o scadere a acestora pentru EPDM si XLPE. In toate esantioanele s-a separat ρ_v si, in cazul celor multi-strat, si ρ_s. Valorile cele mai mari ale lui ρ_v pentru esantioanele uni-strat se obtin in esantioanele EPR, urmate de cele EPDM si XLPE. Acumularea de sarcina spatiala conduce la intensificarea locala a lui *E* in toate esantioanele si, dupa anularea tensiunii, acesta nu dispare, ci ramane un camp electric remanent nenul. Incorporarea unui material FGM in jonctiunile de CC conduce la o acumulare mai redusa de sarcina la interfete intre straturile izolatoare si, in general, conduce la valori mai reduse ale lui *E*. Din analiza tuturor rezultatelor, rezulta ca, intre EPR si EPDM, pentru realizarea jonctiunilor ar fi preferabil EPDM, insa trebuie neaparat imbunatatit gradul de puritate al materialelor de baza si a tehnologiei de fabricare.