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Material identity card methodology

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The main objective of the "Material's Identity Card" project is to take benefit of a theoretical approach in a material evaluation process. High voltage transmission cables and accessories are the targeted applications. Reducing the number of testing procedures in a re-qualification process should lead to a reduction of time of this process, and also of the associated costs.

Our strategy can be divided into the four following steps: (1) survey of synthetic materials making up transmission lines equipments, (2) physical and chemical characterization of these materials, (3) functional analysis of transmission lines equipments and (4) study of structure-property relationships of the concerned materials.

On the one hand, work achieved in the frame of steps 1 and 2 has shown that there is a quite limited number of constitutive basic polymers (PE, EPDM, EVA, silicon) in these equipments. On the other hand, numerous chemical formulations have been identified in the final material after mixing (additives and charges). A list of the major structural and chemical parameters, associated to the well-suited characterization techniques, has been built. It allows us to enlighten the required different levels of investigations to get the most complete, and comprehensive, fingerprint of the material.

The purpose of the functional analysis (step 3) was to establish the link between the equipment functionality and the macroscopic properties of the constitutive materials. The detailed study of each specified functionality (electrical, mechanical, thermal,...) provides the basis of a quantitative approach of the material properties.

Last step aims at clarifying the correlation between structural/chemical properties and the targeted macroscopic property. This has to be made in a quantitative manner. The quantitative and qualitative relationships between characteristic values is required. This make it possible to evaluate the influence of a modification in the material's formulation on its in-service functionality.

The current methodology is now validated on two case studies, dealing with high voltage transmission cables equipments, in collaboration with cable manufacturers.