Natural Rubber Trade Show & International Seminars

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Understanding of the dynamic structure of unvulcanized NR: an essential step to address its quality variability

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ABSTRACT: The first part of this presentation is a visit of the different structural levels of raw natural rubber. The second aims to show that those structures are continuously changing along the way that transforms the latex exuding from the tree to the raw natural rubber material that is introduced in the mixers of the end-used product manufacturer.

Structural levels of Natural Rubber
Three structural study scales could be proposed to describe raw Natural Rubber (NR). The biochemical composition concerns the chemical structure of the poly(cis-1,4-isoprene) macro-molecules, but also the composition of non-isoprene constituents (lipids, proteins, etc.). The mesostructure includes the macromolecular structure (Mw, Mn, molar masses distribution or MMD) and the aggregates formed by the association of poly(cis-1,4-isoprene) molecules (gel). The bulk properties deal with the materials as a whole, and is characterized by physical properties measurements. Some analytical techniques that are available to assess those structural levels will be presented, together with several examples of results.

Dynamic of structuration of Natural Rubber: a long structuring story from the initial producer (i.e. the tree) to the end-used product manufacturer
Object size-based approach such as the three different structural levels described previously is a good descriptive tool of the NR material at a certain time and is very helpful to develop a common understanding. Nevertheless, this description is valid only at a precise stage of life of the NR before it ends in the mixer of the end-user such as the tire manufacturer. The second part of this presentation aims to show how the structure of rubber is permanently evolving not only from the release of latex by rubber tree to the dry state but also in the period of storage lasting from the production of the NR bale in the “remiller” factory to the time of its use in the end-used product manufacturer. Several examples will be provided (effect of tree age, effect of coagulation, effect of maturation, effect of process including drying, effect of storage.)
Understanding of the dynamic structure of unvulcanized NR: an essential step to address its quality variability

Dr. Laurent VAYSSE
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Abstract

The first part of this presentation is a visit of the different structural levels of raw natural rubber. The second aims to show that those structures are continuously changing along the way that transforms the latex exuding from the tree to the raw natural rubber material that is introduced in the mixers of the end-used product manufacturer.

Structural levels of Natural Rubber
Three structural study scales could be proposed to describe raw Natural Rubber (NR). The biochemical composition concerns the chemical structure of the poly(cis-1,4-isoprene) macro--molecules, but also the composition of non-isoprene constituents (lipids, proteins, etc.) [1,2,3]. The mesostructure includes the macromolecular structure ($M_w$, $M_n$, molar masses distribution or MMD, ...) and the aggregates formed by the association of poly(cis-1,4-isoprene) molecules (gel) [4,6]. The bulk properties deal with the materials as a whole, and is characterized by physical properties measurements [5]. Some analytical techniques that are available to assess those structural levels will be presented, together with several examples of results.

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Bibliography


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