

# Dynamic Mechanical and Thermal Properties of Natural Rubber Latex Films Filled with Surface Modified Silica

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## Abstract

Natural Rubber Latex (NRL) is used in numerous fields due to its outstanding performances such as excellent elasticity and essential eco-friendly nature. However, the existing tensile and tear strength of NRL is not sufficient for the functions of extra thin film products. Therefore, scientists work on reinforcement of NRL with silica filler. However, the hydrophilic nature of silica particle makes an unsupportive role to its compatibility with hydrophobic rubber. Hence, surface modification of silica is essential to convert the hydrophilic surface into hydrophobic and it has been successfully accomplished by using hydrophilic polymers. The modified filler is succeeded in preceding studies for the reinforcement of NRL films. Beyond the reinforcement, properties like low stiffness, mechanical and thermal stability also play a major role in enhancing the quality of a consumable thin film product. In order to investigate those properties, Dynamic Mechanical Thermal Analyzer (DMTA) is widely used. The present study focuses on studying such properties of NRL cast films reinforced with silica filler. The surface modification of silica particles and preparation of modified filler (8phr) added cast films are carried out as per the reported methods of our team and the films filled with modified (8M) and unmodified (8U) filler and unfilled (STD) films are analyzed by using tension and dual cantilever modes of DMTA instrument to investigate their thermal and mechanical properties as a function of temperature.

The obtained storage modulus and tan delta curves show the energy dispersion throughout the rubber film with the temperature increment. The tan delta curves shown in Figure 1 illustrate the lowest peak value of tan delta given by modified filler added rubber film (8M). It reveals that 8M has higher energy dispersive ability. The rate of decrease in storage modulus also low in 8M sample at the phase transition region; from glass state to visco-elastic state. It proves that improved interfacial interactions between modified silica and rubber matrix. The higher energy dispersive ability reveals the sustaining of foremost rubbery properties whilst improved interfacial interactions reveal the reinforcement property of modified filler added rubber film.

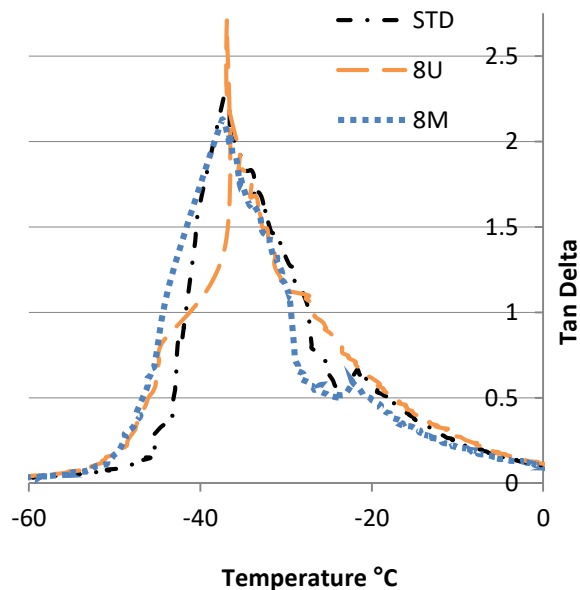


Figure 1: Tan Delta Curve of STD, 8M & 8U samples

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