Atmospheric plasma for modification of rubber composites: insights into curing and mechanical properties

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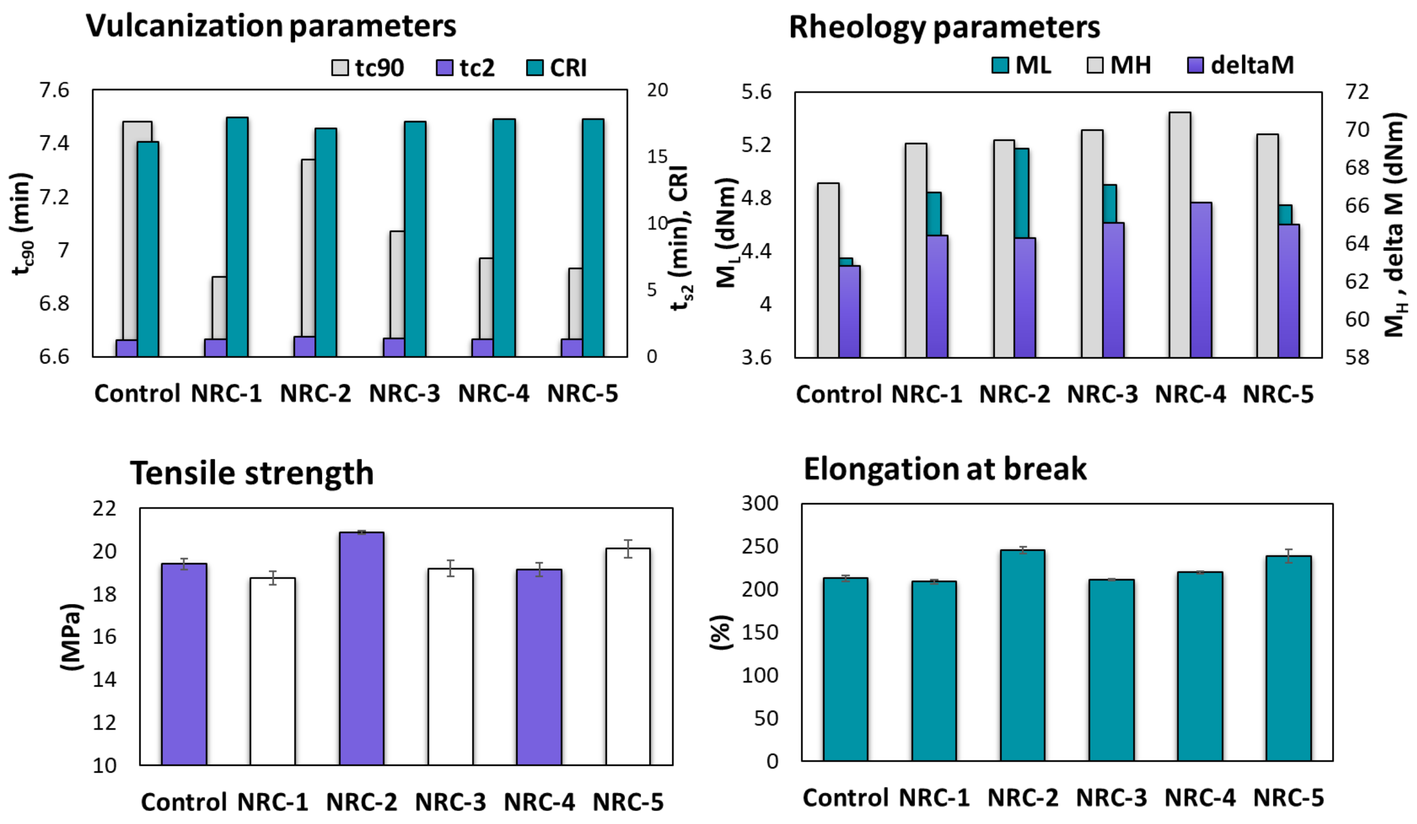
MOTIVATION

The motivation of this work is to investigate the influence of atmospheric plasma on the curing properties of rubber composites and to analyze how plasma treatment affect their mechanical properties. A better understanding of these processes may contribute to the development of more efficient and environmentally friendly material treatment methods, as well as to the optimization of their application in industrial practice.

CURING AND MECHANICAL PROPERTIES

Fig. 2 The changes induced by plasma on the curing and tensile



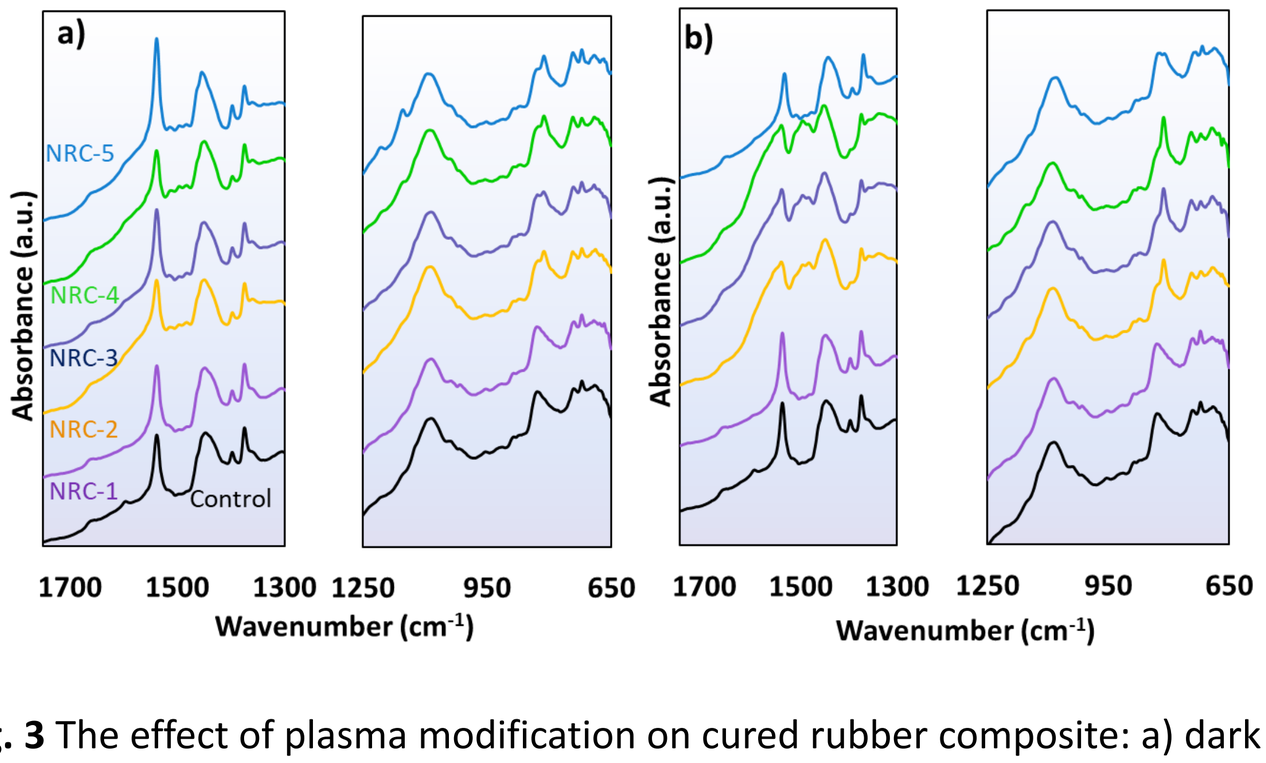
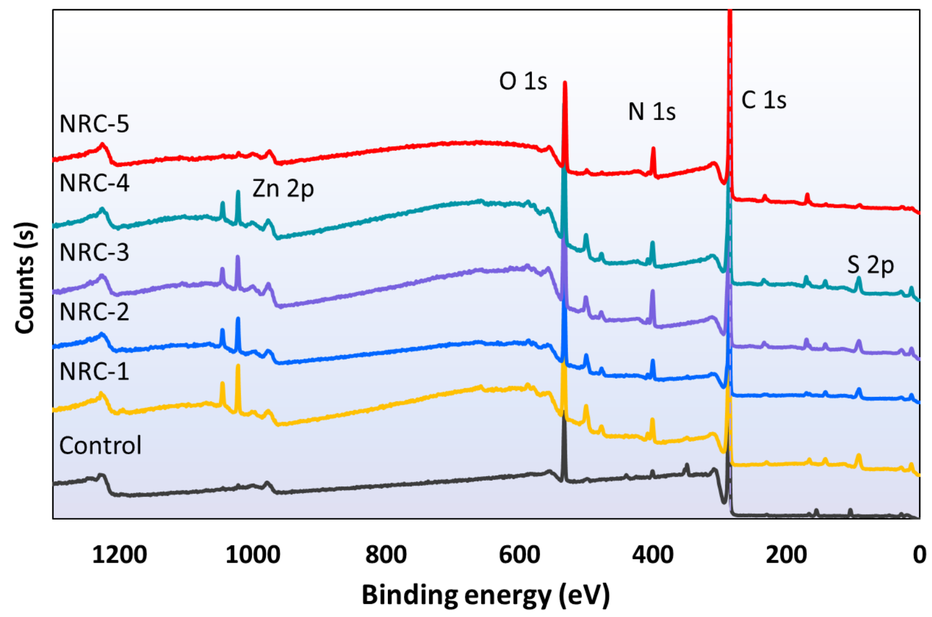


Fig. 3 The effect of plasma modification on cured rubber composite: a) dark area, b) light area

CHEMICAL ANALYSIS

Fig. 1 The effect of plasma modification on rubber composite prior to curing



CONCLUSION

- The results showed that atmospheric-pressure DCSBD plasma accelerated the curing process, with shorter exposure times (NRC-1) leading to even greater curing acceleration. XPS and FTIR analysis revealed microstructural changes related to the incorporation of polar functional groups into the rubber composite backbone. These findings suggest that plasma treatment induced surface charging through the formation of oxygen-containing functionalities and reactive species, which may extend from the surface into the bulk during vulcanization, contributing to faster curing and improved tensile properties.

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