



Phase Transfer Study on The Effects of Metal Ions on Storage Hardening of Natural Rubber

Natural rubber tends to become stiffer during storage, a process known as storage hardening, but the cause of this change is still unclear. This study examined whether metal ions play a role under real storage conditions using a phase transfer method. We used a phase-transfer method to separate natural rubber from its water-based components and to observe the behavior of metal ions during this process. Only small amounts of magnesium, calcium, and iron ions moved together with the rubber, while most added metal ions remained in the water phase. We also found that proteins bound to rubber chains were transferred with the rubber, whereas free proteins stayed in the water.

After two months of storage, untreated natural rubber showed a clear increase in stiffness. In contrast, rubber samples after phase transfer, with or without added metal ions, showed almost no change in stiffness and remained mechanically stable. These samples also contained much less gel and did not show gel growth during storage. Overall, the results indicate that the small amounts of remaining metal ions and bonded proteins do not play a major role in storage hardening. Instead, storage hardening is likely caused by interactions involving other non-rubber components, rather than by the rubber molecules themselves.

The associated SDG goal is Industry, Innovation and Infrastructure (9).

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Reference:

Chanpaka, B., Suchiva, K., Wirasate, S., Phase transfer study on the effects of metal ions on storage hardening of natural rubber, Results in Materials 29 (2026) 100872.

