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The Structure and Strength of Fresh Coagula

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The point of transition from rubber hydrocarbon in the form of particles in latex to that in the form of solid rubber where the hydrocarbon is the continuous phase has always been a matter of speculation. It is not the claim of this short paper to have decided the issue but some of the observations made herein indicate certain lines of approach that may be made the subject of further, more intensive study.

In the micro investigation of the coagulation procedure monoparticle thick films of latex have been spread on coagulating media by the Lanmuir-Adam technique, removed on microscope cover slips after various treatments and examined at high magnifications. Corresponding bulk measurements of tear strength and tensile strength have been made in an approximate way.

The micro investigation shows that the fresh coagulum, as obtained under normal acid coagulation conditions, is particulate in nature but is quite coherent (Fig. 1). On standing, or on stretching (Fig. 2) or rubbing gently (Fig. 3), the particles become less discrete and ultimately a mosaic hydrocarbon continuum network is established which is readily transformed into a solid sheet on further treatment. Prolonged storage of this film leads to breakdown and liquefaction of the rubber (Fig. 4). It is suggested that local displacement of protective protein occurs in the initial stages with consequent local hydrocarbon links, the system being thermodynamically unstable.

The twin photos (Fig 5 and 6) show that even air-dried yellow fraction latex film exhibits a mosaic or particulate structure when wet but a continuous structure when dried completely under high vacuum.

The strength of the bulk coagulum depends mainly on the dry rubber content, rather than on the non-rubbers. The addition of various protein dispersing reagents to the latex has a noticeable influence on the tensile strengths and drying rates however; most additions decreasing the strength and several (such as urea, saponin) greatly accelerating the loss of moisture during the latter period of drying.

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