THE CONSTITUENTS OF HEVEA LATEX

PART III

ANALYSES OF PLANTATION RUBBER AND OF CREAMED LATICES

BY

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Introduction

The method of analysis of fresh latex described in Part I of this series (1) has been applied with only slight modifications to a variety of types of plantation rubber and creamed latex. It is also applicable to ammoniated latex, but since the composition of this product presents numerous special features, it is discussed in a separate paper, Part IV, which follows immediately.

Procedure

RUBBERS

The finely-divided dried sample (30 g.) was added to a mixture of carbon tetrachloride (700 cc.) and acetone (450 cc.), and intermittently stirred until a homogeneous dispersion resulted. The remaining operations were carried out in the usual way.

CREAMED LATICES

The cream was diluted with water to a rubber-content of approximately 30 per cent., and the total-solids-content of the product was determined. Fifty cubic centimetres of this liquid were dried on each of two of the standardised plate-glass frames, and the resulting film was treated in the normal manner.

Results

Tables I and II summarise analyses of a variety of typical samples of plantation rubber and creamed latex. The limits of the amounts of each constituent found in fresh latex to date are included in Table II for comparison. All findings are expressed as percentages of total solids.

TABLE I

Composition of Various Types of Plantation Rubber

Constituent	Smoked Sheet	Pale Crepe	Water-white Crepe	Air-dried Sheet	Crepe from Centrifuged Concentrate
"Ammonium Salt" ...	0.004*	0.004	0.03	0.15	1.24
"Ester"	0.08*	0.07	0.09	0.50	
Fatty Acid Complex ...	1.53*	1.89	1.75	2.46	
Crude Caoutchol ...	3.50	2.07	3.23	3.82	2.29
Phosphate Complex ...	0.20	0.38	0.24	0.22	0.36
Hydrocarbon	94.20	95.20	94.04	92.23	—
Total ...	99.514	99.614	99.38	99.38	—

TABLE II

Composition of Various Types of Creamed Latex

Constituent	Triple-Centrifuged Cream	Tragon Seed Cream	Konnyaku Cream	"Synthetic" Cream	(Fresh Latex)
"Ammonium Salt" ...	0.12	0.09	0.12	1.88*	0.00-0.23
"Ester"	0.28	0.36	0.18	0.43*	0.04-0.60
Fatty Acid Complex ...	1.49	1.59	1.97	2.01*	1.11-2.46
Crude Caoutchol ...	4.40	3.90	3.96	3.47	1.25-4.66
Phosphate Complex ...	0.63	0.74	1.20	1.31	3.54-6.23
Hydrocarbon	—	92.12	91.89	—	84.7-93.7
Total ...	—	98.80	99.32	—	—

Discussion

(i) All the constituents of fresh latex occur in each of the above products derived from it. The figures with asterisks

represent constituents which consist in part of foreign matter acquired in the process of preparation.

(ii) Of the non-hydrocarbon constituents, the phosphate complex alone shows values which lie outside the limits observed for fresh latex (the special case of the "Ammonium Salt" of the "Synthetic" creamed concentrate is discussed below).

(iii) The amounts of the water-soluble phosphate complex are all considerably lower than those found for fresh latex. This is the natural consequences of the fact that the "serum solids" which constitute the bulk of the phosphate complex are, to a large extent, removed in the sera during the preparation of all the above specimens.

(iv) It is noteworthy that the "ammonium salt", although water-soluble, nevertheless appears in normal amounts. It must therefore be associated in latex with another constituent in such a way as to be retained by the rubber-phase during the preparation of raw rubbers and creamed latices.

Smoked Sheet

The "ammonium salt" of smoked sheet includes a small amount of a simple phenol (guaiacol or a cresol) derived from the smoke. It was detected by its odour and by the development of a green colour with ferric chloride. More complex phenolic bodies from the smoke, similarly detectable, occur in the "ester" and the fatty acid complex. The caoutchol isolated was unusually tacky, the hydrocarbon was normal.

Pale Crepe and Air-Dried Sheet

Apart from their low content of phosphate complex, these materials provided components indistinguishable from those of fresh latex.

"Water-white" Crepe

The analysis closely resembles that of pale crepe. This observation is of particular interest, since this superfine grade of crepe is prepared by a process of fractional coagulation, which might be expected to remove, at least partially, certain of the major non-hydrocarbon constituents. It was noticed however that all the constituents isolated were unusually light in colour.

Crepe from Centrifuged Concentrate

This specimen of crepe was prepared by coagulation of the diluted ammoniacal concentrate with magnesium silicofluoride, and

soaking of the resulting coagulum before machining. It was less readily soluble in benzene and in carbon tetrachloride than normal rubber, and remained incompletely dispersed by the usual carbon tetrachloride-acetone mixture even after 72 hours. The caoutchol isolated was very tacky, while the hydrocarbon was not easily soluble in rubber solvents. These are characteristic features of all rubber derived from ammoniated latex, and are discussed in the ensuing paper.

Triple-Centrifuged and Tragon-seed Creamed Concentrates

Quantitatively, these materials present no unusual features. The drastic washing action involved in their preparation resulted in the isolation of unusually light-coloured non-hydrocarbon constituents. The effect of ammoniation was seen in the tacky texture of the crude caoutchol and in the increased resistance to solvents of the hydrocarbon.

Konnyaku-Creamed Concentrate

The analysis of a cream prepared by addition of Japanese Konnyaku meal to ammoniated latex presented no additional features.

"Synthetic" Creamed Concentrate

The creaming agent used in the preparation of this material was a proprietary substance, appreciably soluble both in water and in acetone. It is used in much larger quantities than the above two vegetable creamers, and appreciable quantities of it are therefore retained in the concentrate. Its solubilities caused it to appear among the non-hydrocarbon constituents as shown in Table II*. The characteristics of the caoutchol and hydrocarbon fractions corresponded with the fact that no ammonia was used in the creaming process; that is, they resembled the corresponding products from fresh latex.

Summary

(i) The method described in Part I of this series (1) for the quantitative separation of the constituents of fresh latex has been applied to plantation rubber and creamed latices.

(ii) Quantitatively, the water-soluble phosphate complex alone among the constituents of raw rubber and creamed latices differs from the values found for fresh latex. The low values observed for this constituent reflect the removal of the "serum solids" in the different processes of preparation.

(iii) Qualitative differences from the constituents of fresh latex are of two kinds only:

(a) those due to the occasional inclusion of foreign matter introduced during manufacture;

(b) those due to chemical changes produced in certain constituents by the action of ammonia.

This subject is developed in the ensuing paper.

Literature Cited

(1) ROBERTS, K.C., This *Journal* **7** (1936) 46

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