1042 PATTERSON : A PROPERTY OF ETHYL TARTRATE.

CXXIV.—A Property of Ethyl Tartrate.

By THOMAS STEWART PATTERSON.

In the March number of this Journal (this vol., p. 532) there appears a paper by Messrs. Lowry and Cutter dealing with ethyl tartrate, in which they state (i) that "almost all commercial samples of ethyl tartrate are yellow in colour," a similar colour having been also observed in one of their own samples. "This colour is undoubtedly due to an impurity, since it can be removed by freezing out and centrifuging the crystalline ester." And, (ii), "The purified ester, developed a yellow colour when heated in the distilling flask, and gave a yellow distillate, the colour of which disappeared, however, after a few hours." This colour, they regard as an indication of *purity* rather than of *impurity* in the sample (pp. 537–538) and they regarded it as perhaps the result of a reversible dehydration (p. 544).

Since 1895 I have been aware that under certain circumstances ethyl tartrate may develop a transient green colour and from time to time I have carried out experiments on this subject, but since these have not reached the stage I should have wished, they have not previously been referred to. In view, however, of Lowry and Cutter's work I should like now to indicate briefly the conclusions which have so far been arrived at. The green substance which Lowry and Cutter rightly regard as an impurity, and which can be fractionated out of the ester, possesses the remarkable property not mentioned by them that, when present in the ethyl tartrate in quantities not too large, it becomes perfectly colourless on standing for some time. The impurity therefore possesses the characteristic which Lowry and Cutter attribute to specially pure ethyl tartrate.

Since substances the colour of which fades on standing and returns again on re-heating are uncommon and possess a peculiar interest, the matter is perhaps one of importance, and I have therefore constantly kept it in mind. The first indication of the cause of this green colour was given by a slight accident during distillation, whereby a considerably too rapid stream of air was sucked for a short time through the ester at a temperature of about 200° . The first runnings in the distillation then came over bright green, almost grass green, in colour, but on standing for a time became colourless or practically so. Even in such a case, however, the substance producing this effect is probably present only in small quantity, since it does not much lower the rotation of the ester; but that it is not an indication of purity in the ethyl tartrate but merely an

impurity seems to be certain from the fact that it may be almost completely-or completely-fractionated out of the ester. It is quite certain that on distilling a sample of such ethyl tartrate the first runnings are very much more green than the later fractions. Some twenty years ago, at Leeds, Mr. W. Lowson, B.Sc., was good enough to carry out for me a few experiments in this connexion. Ethyl tartrate prepared by the hydrochloric acid saturation method was heated to a temperature of about 200°, and then a stream of air was sucked through the ester. We hoped in this way to obtain a considerable quantity of the green product, but our collaboration had to be discontinued before we had succeeded in our efforts. \mathbf{It} may be recorded, however, that in one experiment, after the heating had been carried on for some time, the whole contents of the flask suddenly became converted into a carbonaceous mass. We have not been able to find a method for isolating the impurity, possibly because it is present in only small quantity mixed with a large proportion of ethyl tartrate. If the impurity is present in sufficient quantity it may impart a permanent green colour to the ethyl On heating a colourless sample of ester of this kind, the tartrate. green colour develops at a temperature of about 120°, and it is also noticeable that, conversely, although both the liquid trapped in the neck of a Claisen distilling flask and the hot vapour in the neck of the flask may appear quite colourless, the distillate may, nevertheless, be distinctly green.

Since the appearance of Lowry and Cutter's paper the foregoing observations have been verified. A bottle is kept in this laboratory labelled green ethyl tartrate and to it are consigned any samples which have become green during preparation, as it is preferable to use only pure and colourless products. Some of this specimen, which exhibited, permanently, a slight green colour, was very carefully distilled at a pressure between 1 and 2 mm., from a Claisen flask with a high side tube. The tartrate boiled in the neighbourhood of 117° with the oil-bath at a temperature of about 157° . The first fraction was bright green, and three successive fractions showed a rapidly diminishing colour. The last fraction had only the faintest tinge of green. All, except the first, became perfectly colourless on standing for a time. It is thus evident that the green substance can be fractionated out; it is also evident that it is no ordinary impurity.

The distillation was stopped when nearly half of the original ester remained in the flask. This was then heated to a temperature of about 200° on an oil-bath, and air was sucked through the hot ester for a few minutes. Distillation at low pressure was then recommenced, and the first fraction came over almost grass-green in

002

colour. The coloured impurity, doubtless an oxidation product, had been re-formed.

I propose to continue the investigation of this remarkable phenomenon.

ORGANIC CHEMISTRY DEPARTMENT, UNIVERSITY OF GLASGOW.

[Received, April 6th, 1922.]