

Short Communications

A New Colour Reaction on Copper and Certain Carbonyl Compounds

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During an investigation of oxalyldihydrazide¹ it was found that a number of its condensation products with aldehydes and ketones give a very sensitive blue colour reaction with copper salts. Several hydrazones not earlier mentioned in the literature were prepared and tested. The hydrazones of simple aliphatic aldehydes (formaldehyde, acetaldehyde, propionic aldehyde, *n*-butyric aldehyde and 2-ethylbutyric aldehyde) and ketones (acetone, methyl-ethyl ketone, methyl-iso-butyl ketone, methyl-*n*-amyl ketone) and of the cyclic ketones cyclopentanone and cyclohexanone give the reaction distinctly. With other hydrazones, for instance those of benzaldehyde and furfural, no reaction of the same kind could be obtained. For reagent purposes the bis-cyclohexanone-oxalyldihydrazone, $C_6H_{10} : N \cdot NH \cdot CO \cdot CO \cdot NH \cdot N : C_6H_{10}$, seems to be the best one.

A solution of this compound in dilute alcohol gives a blue coloration with a copper salt in faintly alkaline solution. If the reaction is carried out in an ordinary test-tube, copper can be detected even at a dilution of 1 : 40 000 000. Ammonium salts and free hydrazide promote the reaction. By means of this reagent the presence of copper in filter paper and in com-

mercial distilled water can easily be shown. The blue colour is rather stable and it therefore seems to be possible to use the reaction for quantitative determinations, too.

Because the hydrazide itself gives a green colour reaction of moderate sensitivity with copper salts and the formation of hydrazones takes place very easily in most cases, the reaction can obviously also be used as a test for those carbonyl compounds, the hydrazones of which give the blue colour reaction with copper salts. Thus the presence of such compounds in several kinds of vegetable materials was easily shown; further in a number of commercial solvents, even in those of analytical grade. It must, however, be pointed out that the reaction is not a general one for carbonyl compounds.

Concerning the nature of the blue solution nothing can be stated at the present moment. Several facts, however, suggest that the complex-forming compound is not the dihydrazone itself but a monohydrazone, like $R : N \cdot NH \cdot CO \cdot CO \cdot NH \cdot NH_2$, which is formed by the hydrolyses of the dihydrazone. More experimental work is needed on this point.

† The author wishes to express his thanks to Swedish Natural Science Research Council for financial support and to Mrs. Greta Lundquist for assistance in the experimental work.

1. Nilsson, G. *Svensk Kem. Tid.* **56** (1944) 295; cf. also *Nature* **157** (1946) 550; *Métalurgie et Corrosion* **23** (1948) 206.

Received Februar 7, 1950.