In this way the following additional isotopes of elements can safely be predicted to occur: A 38; Ca 42; K 43; Ti 44, 46 and 52; Sc 47; Cr 48 or 56; Fe 56, 60, 57 and 58; Ni 56 or 64, 61 and 62; As 77; Se 79 and 81; Sr 84, 87 and 89; Kr 85; Zr 88, 91 and 93; Y 91; Nb 95; Ma 99; Rh 103; Pd 100, 102, 104, 106, 108 and 110; Cd 108 and 120; Te 116, 120, 122 and 124; Ba 128, 132, 134 and 140; Ce 132, 136, 138, 141 and 144; Nd 136, 140 and 148; La 137; W 188; Pt 190 or 198, 192, 194 and 196; Pb 204 and Hg 208.

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TETRAARYLARSONIUM HALIDES

Sir:

Alkyltriarylarsonium compounds have been prepared in considerable number but it seems that the tetraarylarsonium type has not been described hitherto.

It has been found that tetraarylarsonium halides can be obtained readily by interaction of an arylmagnesium halide with a triarylarsine oxide and subsequent treatment of the reaction mixture with a halogen acid: for example, addition of hydrochloric acid to the product formed from phenylmagnesium bromide and triphenylarsine oxide yields tetraphenylarsonium chloride (m. p. 272–274°); by the use of hydrobromic or hydriodic acid the corresponding bromide (m. p. 273–275°) and iodide (m. p. 292–293°) are obtained.

These halides are beautifully crystalline compounds and the halogen is not removed by brief treatment with alcoholic sodium hydroxide or molecular silver.

An extensive investigation of these compounds is in progress.

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HIGHER VALENCE STATES OF SILVER

Sir:

Recently considerable attention has been given to the higher valence states of silver, but no reports have appeared on bivalent silver in the form of anhydrous fluoride, although as early as 1891 Moissan stated that silver is attacked by fluorine at 100°, and at red heat the two elements combine with incandescence.

There has been prepared in this Laboratory by the action of fluorine on silver foil at 300°, a black material which differs in every respect from ordinary silver fluoride, and which all evidence indicates to be the difluoride, AgF_2. The compound is not very stable, decomposing quickly in moist air, if heated, and becoming covered with a coating of yellow AgF. Decomposition occurs similarly, but more slowly, at room temperature and even efforts to remove all water vapor will not prevent completely this slow change. The material is a powerful oxidizing agent. Qualitatively it will react with dilute acids to liberate ozone, and with aqueous solutions in general to liberate ozone or oxygen. It releases iodine from iodides, converts ferrous salts to ferric salts, chromium salts to chromates, manganese dioxide to permanganates in both acid and basic media and oxidizes alcohol to acetaldehyde.

Analyses of the material indicate that it is a mixture of fluorides of monovalent and bivalent silver, while the iodine liberated from a very cold, concentrated potassium iodide solution shows that at least three-fourths of the silver is in the higher valence state.

By the action of cold concentrated potassium hydroxide on the above fluorides, there is produced a stable material that can be washed free of alkali and dried. Determinations of its silver content and its oxidizing ability support the assumption that it is a mixture of $Ag^{II}O$ and $Ag^{I}OH$, with 70 to 80% of the silver as Ag^{II}. However, the oxidizing ability might be explained by presence of the peroxide Ag-O-O-Ag.

There is some evidence that an active complex can be formed from the bivalent silver fluoride by molten KHF_2.

Further work will be undertaken on all three phases of this problem.

In addition, Hettich [private communication] in this Laboratory, has obtained some evidence that silver in higher valence form can be obtained by electrolysis.

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SOME PROPERTIES OF PURE H^2H^2O

Sir:

We have recently pointed out [Lewis and Macdonald, *J. Phys. Chem.*, **1**, 341 (1933)] that our process of concentrating the isotope of hydrogen could easily be continued to the point of eliminating practically all of the H^1. Before trying this experiment we had hoped to accumulate a considerable amount of heavy water, but the demand for this material has been so great that we have been obliged to proceed with the amount obtained in one series of electrolyses, which yielded 0.3 cc. of water in