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STUDY OF THE PROPERTIES OF GROUP B METALS IN THE LABORATORY

Khayitov Fakhriddin Shodievich
Teacher of chemistry, Academic Lyceum at the Tashkent State University of Law, Department of Exact Sciences.
fahriddin_hayitov7777@mail.ru
+998 977827408

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Abstract:

The formation of ionic bonds is possible only between atoms whose electronegativity differs by a very significant amount. There are relatively few ionic compounds. It is worth remembering that these include halides and oxides of alkali (the main subgroup of the first group) and alkaline earth (the main subgroup of the second group) metals. Ions can also consist of several atoms. Within such ions, the bonds are not ionic (they will be discussed below), but between ions they are ionic.

Keywords: Industrial Current Densities, Oxidizing Agents, Chemical Elements, Scientific Achievements Of The Laboratory, Theoretical Current Efficiency.

Examples of compounds such types are salts, for example. They have two charged groups - a metal ion (K) and an acid residue ion (80). An ionic bond occurs between these ions. Within complex ion 30, the 8-0 bonds are non-ionic (the nature of these bonds will be discussed in the next section). [c.60] Metallurgy is divided into ferrous (obtaining iron and its alloys) and nonferrous (obtaining non-ferrous metals). Non-ferrous metallurgy is engaged in obtaining light (aluminum, magnesium, titanium, alkali metals), heavy (copper, lead, zinc, tin) and noble (gold, silver, platinum group) metals. The first of these includes metals released from aqueous solutions either without overvoltage at all (mercury), or with a very low overvoltage, not exceeding thousandths of a volt at ordinary current densities (silver, thallium, lead, cadmium, tin). For this group metals (except mercury), the instability of the potential with time is most clearly manifested; At industrial current densities, these metals give coarse deposits. The exchange currents for metals of this group are very high. So, for example, the exchange current between metallic mercury and a solution of its nitrate exceeds 10 A-m, and between silver and a solution of silver nitrate reaches 10 A-m. KaAs mentioned above, N1 and Co belong to the group of metals with a low overvoltage of hydrogen evolution on them. As regards Pb, Sn, Cc1, the hydrogen overvoltage on these metals is very significant. Therefore, their electrolysis can also be carried out at pH = 1. For example, lead in acidic solutions behaves like an electropositive metal. Lead sulfate is slightly soluble, its concentration in water at 25 ° C is 1.5-10 g-mol l. But even at such a low concentration, lead is deposited on the cathode from a saturated sulfate solution in spongy form with almost theoretical current efficiency.

According to the degree of thermodynamic instability, all metals are divided into five groups (N. D. Tomashov), consistent with their position in the stress series (Table 11.5). The group of metals with increased thermodynamic instability consists of metals having a standard electrode potential value less than the potential of a hydrogen electrode at pH 7 (-0.413 V). These include Eb, Cs, Ba, Sr, Ca, Na, Mg, A1, T1, bm, Mn, Cr, bn, Her. These metals can corrode even in neutral environments, i.e. when creating the necessary conditions are oxidized by water. Of course, these metals also corrode in acidic environments - under the action of acids, as well as under the action of other oxidizing agents and, in particular, oxygen.

In this case, the following process formally proceeds. These considerations, expressed by L. I. Antropov, led him to the conclusion that there are two extreme groups of metals with a different mechanism of hydrogen overvoltage. The first of these includes metals of the platinum and iron groups, which have a high and adsorption capacity for hydrogen. On these metals, the recombination stage should play a decisive role in the kinetics of cathodic hydrogen evolution. The second group includes mercury, lead, cadmium and other metals that hardly adsorb hydrogen. On metals of the second group, the kinetics of hydrogen evolution is determined by the stage of discharge.

Complexing synthetic ion exchangers contain groups of atoms located in a certain way, capable of forming coordination bonds with metal ions. Ion exchangers with complexing properties have increased selectivity to certain metals or a group of metals. The value a corresponds to the value of the overvoltage on the given metal at I = 1 A/cm. For P1, Pc1, the value of a, therefore, the overvoltage is relatively small; at the same time, it is possible select a group of metals with high values of a and overvoltage (Sn, C, H, Pb). The coefficient b in the transition from one metal to other changes little and averages 0.11-0.12. The state of the metal surface significantly affects the magnitude of the hydrogen overvoltage. With the same linear dimensions of electrodes made of the same metal and the same current strength, the current density and overvoltage on a roughly machined rough surface are less than on a smooth, polished one.

In connection with these in electrochemical measurements to reduce polarization phenomena, a platinum electrode is widely used, on which platinum black is electrolytically applied. As the temperature rises, the hydrogen overvoltage decreases, and the temperature coefficient depends on the nature of the metal; for metals with a low overvoltage, it is 1–2 mV/K; for metals with a high overvoltage, it is 2–4 mV/K. Solid oxidation catalysts can be conditionally divided into groups of metals, simple and complex metal oxides, salts. Under conditions of catalytic oxidation, the surface of metals is covered with a thin layer consisting of oxides, and therefore the mechanism of oxidation on metals and oxides has much in common. More than 80% of the known chemical elements are metals and, in accordance with the structure of the electron shells, they include s-elements of groups I and II, all elements of d- and /-families, p-elements of group III (except boron), as well as tin and lead (IV group), bismuth (V group) and polonium (VI group). Most of the metals have an external energy- Chemical properties of group V metals. -Metals of group V have high chemical activity, exhibit a variable degree of oxidation, and niobium and tantalum in compounds have mainly the highest degree of oxidation. The distribution of electrons in these metals, see table. 12.16, and some of their physicochemical properties.

Electrochemical properties of manganese and electrode reactions. In terms of electrochemical properties, manganese belongs to the same group of metals as zinc and cadmium, i.e., to metals with a low overvoltage and a high exchange rate (see Table IX-1), therefore manganese is prone to the formation of coarse-grained precipitates, to dendritic formation. A sufficiently high overvoltage of hydrogen on manganese still does not provide a negative potential for hydrogen evolution, and only at pH = 2 or more does manganese succeed in highlight at the cathode Silver. According to its electrochemical properties, silver belongs to the group of metals with a very low overvoltage of the discharge and ionization of the metal and a high overvoltage of hydrogen.

In this regard, it is very difficult to obtain dense cathode deposits of silver from its simple salts; they precipitate in the form of dendrites, sponges, needles, but with a high current efficiency. The group of metals iron, zinc, copper, cobalt and a number of others can be extracted and concentrated even from highly mineralized solutions using silica gel pre-charged with alkali or alkaline earth metal ions. The active inorganic ion exchanger is Na-silica gel obtained by heating silica gel with calcium hydroxide slurry for several minutes. Until now, it was believed that this group of metals does not form ions or forms them to an insignificant extent. In such cases, not only protrusions and irregularities appear on the catalyst surface, which contribute to the formation of tubular filaments, but also free particles. Catalysts that play an independent role in the formation of filamentous carbon. Evidence for the proposed mechanism of the carbide cycle can be a common limiting step and a common intermediate- Contact of medallions belonging to the same group is considered acceptable. The metals of each subsequent group increase the corrosion of the metals of the previous group. Corrosion can, however, be observed when metals come into contact within a group; the metals of each group tend to corrode, being in contact with metals, located 1) 1 Mn in a group behind them. N. I. Kiboze and co-workers established that promotion is the result of the active surface function.

Some studies directly show that the promoter increases the number of active sites. Thus, for example, the synthesis of ammonia over pure iron showed that the ratio of the number of active Fe atoms to their total number is 1/2000, while with the addition of AP O., or Al, Oz-K20, it rises to 1/200, i.e. 10 times. D.V.Sokolsky , when studying the activation of nickel by the platinum group of metals, found that rhodium causes the greatest effect, since the constant The use of masks. Titration methods based on this proceed from the fact that, for example, one or a group of metals bind into complexes that are stronger than with EDTA or precipitate, etc. Thus, aluminum and titanium interfere with the titration of rare earth and alkaline earth elements. However, A1 and T1 can be disguised by tying them into strength complex with pyrocatechol (the sulfa derivative of pyrocatechol is more often used - Tyron). Rare earth elements, as well as indium and lead, can be titrated in the presence of zinc, copper, cadmium, cobalt, and other metals, if these latter are bound into stable complexes with potassium cyanide.

Titration of zinc, cadmium, etc. is hindered by mercury; it can be easily masked with iodide. The evolution of this group of metals at the cathode is possible due to the occurrence of an overvoltage of hydrogen evolution on these metals. They can divide into two main groups according to the magnitude of the overvoltage of hydrogen evolution on them (see tile. 12-14). So, metals - mercury, zinc, lead, k.ad- In addition to acid and medium salts, there are basic salts. They are formed when an acid reacts with an excess of a base. In this case, not all gyrogroups of the base are replaced by acidic residues. The valency of such a group (a metal with a hydroxy group) is determined by subtracting the number from the valency of the metal in the corresponding hydroxide about unsubstituted hydroxy groups.

The most important scientific achievements of the laboratory: a) new reagents of organometallic synthesis have been discovered and introduced into wide synthetic practice; b) new methods of organometallic synthesis have been created; c) a number of previously unknown types of organometallic compounds have been discovered; d) competitive, and in some cases record-breaking in efficiency, catalysts for a number of practically important processes have been created: high-temperature oxidation of liquid hydrocarbons and solid fuels, catalysts for polymerization and copolymerization of olefins, regulators of the recombination of atoms and small molecular particles on solid surfaces; e) organ element compounds have been studied to change the sensitivity range of hard X-ray counters; f) effective and safe methods have been developed for cleaning the metal surfaces of museum exhibits and daguerreotypes from all types of chemical contaminants and corrosion products; g) families of framework Atran systems with a wide range ofm biological activity; h) anisotropic coordination metal-polymer materials were obtained for the needs of modern high technologies.

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