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Halogen displacement reactions colours

INORGANIC Part 9 Group 7/17 Halogen sub-index: 9.1 Introduction, trends & Group 7/17 data * 9.2 Halogen migration reaction and reactivity trend * 9.3 Halogen reactions with other elements * 9.4 Reaction between halide salts and conc. rikkihappo * 9.5 Halogeenien ja haloidi-ionien testit * 9.6 Halogeenien uuttaminen luonnollisista lähteistä * 9.7 Halogeenien ja yhdisteiden käyttö * 9.8 Ox yltiaatio & vähentäminen – lisätietoja halogeenien ja halidi-ionien redox-reaktioista * 9.9 Tilavuusanalyysi – halogeenihin tai halidi-ioneihin liittyvät titraukset * 9.10 Otsoni, CFC: n ja halogeenin orgaanisen kemian linkit * 9.11 Kemiaallinen sidos halogeeniyhdisteisiin * 9.12 Halogeenikemian muut näkökohdat Pitkälle edenneen tason epäorgaanisen kemian jaksollinen taulukkoindeksi * Osa 1 Jaksollinen taulukkohistoria * Osa 2 Elektronikooppaanot, spektroskopia, vetyspektri, ionisaatioeneret * Osa 3 Jakson 1 tutkimus H to He * Osa 4 Jakson 2 tutkimus Li–Ne * Osa 5 Jakson 3 tutkimus Na to Ar * Osa 6 Jakso 4 tutkimus K–Kr ja tärkeät trendit alas ryhmää * Osa 7 s-lohkoryhmät 1/2 Alkalimetalli/Emäksiset maametallit * Osa 8 p-lohko ryhmät 3/13 - 0/18 * Osa 9 Ryhmä 7/17 Halogeenit * Osa 10 3d lohkoelementit & Transition Metal Sarja * Osa 11 Group & Series data & periodicity plots * Kaikilla 11 osalla on omat alaindeksinsä lähellä sivujen yläosaa

9.2 Halogeenin siirtymäreaktio ja ryhmän 7 reaktiivisuustrendi Muutama tippa kloorivettä , bromine water and id water are added to the water-soluble solutions of potassium chloride (KCl), potassium bromide (KBr) and potassium irid (KI). Three combinations produce a reaction (and three do not!). You can get simple observations from the charts! Dark compared to the effect of water blanks confirm that a transitional reaction has occurred. Chlorine displaces bromine from potassium bromide and llyme from potassium iode. Bromine displaces iodine only from potassium iodine, not least reactive iodine can displace chlorine or bromine from their salts. Halogen added KCl solution KBr solution KI solution AIHI water chlorine Cl2 VERY light green solution 1. orange-reddish-brown solution 2. brown solution–black sading VERY light green solution bromine Br2 orange-reddish-brown solution orange-reddish brown solution 3. brown solution–black pre-prey orange-reddish-brown solution J2 dark brown solution Dark brown solution On the grounds that the most reactive element displaces the least reactive element, the order of reactivity must be: chlorine > bromine > iodine The word, molecular symbol and ionic equations of the diagram are shown below.

1. chlorine + potassium bromide ==> potassium chloride + bromine Cl2(aq) + 2KBr(aq) ==> 2KCl(aq) + Br2(aq) Cl2(aq) + 2Br⁻(aq) ==> 2Cl⁻(aq) + Br2(aq) 2. Chlorine potassium iodide ==> potassium chloride + iodine Cl2(aq) + 2KI(aq) ==> 2KCl(aq) + I2(aq) 3. bromium + potassium iodide ==> potassium bromide + iodine Br2(aq) + 2KI(aq) ==> 2KBr(aq) + I2(aq) Br2(aq) + 2I⁻(aq) ==> 2Br⁻(aq) + I2(aq) The halogen molecule is an electron acceptor (oxidation agent) and is reduced by the strengthening of the electron to form halidi-ion. Halogen molecule halogen oxidation status changes (decreases) from 0 to –1, electron strengthening, reduction Halidi-ion is an electron donor (reducing agent) and oxidizes electron loss to form halogen molecule Halogen oxidation state in halide ion changes (increases) from –1 to 0, electron loss, oxidation chlorine molecule + bromide-ion ==> chloride ion + bromimolecular ionically redoxy equations are recorded on ... 1. Cl2(aq) + 2Br⁻(aq) ==> 2Cl⁻(aq) + Br2(aq) because potassium ion K⁺ is my spectator ion, i.e. it does not participate in the reaction. The other two possible reaction equations involving (i) chlorine + iodine and (iii) bromine + iodine are similar to the example above.

2. Cl2(aq) + 2I⁻(aq) ==> 2Cl⁻(aq) + I2(aq) 3. Br2(aq) + 2I⁻(aq) ==> 2Br⁻(aq) + I2(aq) Explaining the halogen reactivity trend in Halogen Section 2 of Group 7: F [2.7] + e⁻ ==> F⁻ [2.8]– Section 3 halogen: Cl [2.8.7] + e⁻ ==> Cl⁻ [2.8.8]– Section 4 halogen: br [2.8.18.7] + e⁻ ==> Br⁻ [2.8.18.8]– Section 5 halogen: I [2.8.18.18.18] 7] + e⁻ ==> I⁻ [2.8.18.18.8]– When the halogen atom reacts, it causes the electron to form a single-negative ion e.g. Cl + e⁻ ==> Cl⁻ with a stable noble gas electron structure such as argon, (2.8.7 ==> 2.8.8) When you count a group from one halogen element in group 7 to another . . F ==> Cl ==> Br ==> I ... the atomic beam increases due to the extra filled electron shell, the neo-electrons are further and further away from the core and also protected by the extra full electron shell of negative electron charging, so the positive nuclei attract uselektrons less and less strongly than any incoming electrons to form a halide ion (or distributed to form a hardlent bond). So this combination of factors means attracting the eighth high electron is becoming increasingly difficult as you go down the group, so the element is less reactive when you go down the group, that is, less energetically able to form an X-halide ion's ordinance increases.

9.3 Reactions of halogens with other elements 9.3a) The reaction of halogens with hydrogen H2 halogens is easily combined with hydrogen to form hydrogen-free hardlent molecule hydrogen hallucinations. (Halogen compounds – rough bonding check notes) e.g. hydrogen + chlorine ==> hydrogen chloride H2(g) + Cl2(g) ==> 2HCl(g) Hydrogenhalides soluble in water very strong acids with pH1 solutions, such as hydrogen chloride, form hydrochloric acid in water HCl(aq) or H+Cl⁻(aq) because they are fully ionized in aqueous solution, even though the original hydrogen gases are coylents! Acid is a substance that forms H⁺ ions in water. Bromine forms hydrogen bromide gas HBr(g), which is dissolved in water with hydrobromic acid HBr(aq). Iodine forms hydrogen iodide gas HI(g), which dissolved in water forms hydroiodic acid HI(aq). Note the formula pattern for the group. The mechanism of a direct combination of chlorine and bromine (X2) and hydrogen is a classic case of free radical chain reaction. (i) start step: X2 ==> 2X. Homolytic bonding fission with heat or light gives two halogen-free radicals, (ii) application steps: X. + H2 ==> HX + H. followed by H. + X2 ==> HX + X. Two steps that give the product a free radical to continue the end steps of the chain reaction (iii) . H. + X. ==> HX or 2H. ==> H2 or 2X. ==> X2 Three possible ways to end the chain set. 9.3b) Reaction of halogens with group 1 alkaline metals Li Na K, etc. Alkaline metals burn very exoterately and intensely in chlorine when heating colourless crystalline ion salts such as NaCl or Na+Cl⁻. This is a very expensive way to make salt! It is much cheaper to produce it by evaporating seawater! e.g. sodium + chlorine ==> sodium chloride 2Na(t) + Cl2(g) ==> 2NaCl(s) Sodium chloride dissolves in water to give a neutral solution pH 7, the general indicator is green. Salt is a typical ion compound, i.e. a fragile solid with a high melting point. Similarly, potassium and bromine form potassium bromide KBr or lithium and iodine form lithium iodine Ii. Note the formula pattern of the group again. (Halogen compounds – ionetic bonding check notes) 9.3(c) Reaction of halogens with other metals (iron and aluminium) Reaction of the original with chlorine: Burns strongly in chlorine gas when heated, forming a white* solid aluminium chloride when chlorine gas is heated. aluminium + chlorine ==> aluminium chloride 2Al(s) + 3Cl2(g) ==> 2AlCl3(s) * It is often slightly yellow because it has traces of iron (II) of chloride. The structure of aluminium chloride, which is a strange substance by its behavior! The solid, AlCl3, consists of an Al3+ ion-layered ion lattice surrounded by six Cl-ions, although through the powerful polarizing power of al3+ ion and its effect through the outer electron clouds of chloride ions, you would expect some co kovalent character. However, rather strangely, in heating solid aluminium chloride, as you approach the melting point, the electrical conductivity increases rapidly (the ions move) but drops to almost zero at the melting point. At the same time, the density will also decrease by 45%! What appears to be happening in heating, just under –180oC, the kinetic energy of the ion vibration of the grid is sufficient to cause some freedom of movement - an increase in electrical conductivity. But at the melting point, alCl3's ionic lattiche breaks down and sublimation occurs (s ==> g), NOT ion melting! The cause is a volatile hard-pilot molecule. In the melting process, the nature of the aluminium-chlorine bond changes from ion to hardenth and the codendin number of the aluminium ion changes from ion-6 to a co-pilot four, forming the easily vaporized co-pilot molecule Al2Cl6 as described above. So a common change is the ion-type laticy molecule in the lattile - when the steam solidizes on a cold surface. Note on other aluminium diameters. Aluminium fluoride is a classic high-melting ionic lattice compound with melting that gives an electrically conductive liquid from moving ions. Aluminium bromide solid consists of a truss of rough dimming molecules of no obvious ionic character. So, by ionic nature: AlF3 > AlCl3 > AlBr3 (> AlI3), which fits with the expected binding marker for the reduced electrode negativity of aluminium and halogen. You can also make iron (III) chloride in the same way. iron + chlorine ==> iron(III)chloride(brown solid) 2Fe(s) + 3Cl2(g) ==> 2FeCl3(s) Molecular iron (III) chloride is formed and consists of dimming molecules, Fe2Cl6 so the equation should actually be written as follows: 2Fe(s) + 3Cl2(g) ==> Fe2Cl6(s) If the iron-halogen test is repeated with brom, the reaction is less pronounced and iron(III) bromide is formed. The exominent nature of the reaction can be seen or be under fire? Dimming molecules are in brown solids. 2Fe(t) + 3Br2(g) ==> Fe2Br6(s) The reaction is easy to indicate by heating a little bromine with iron wool in the smoke cabinet! When iron wool is heated with id, the reaction is low, a small amount of iron (II) id is formed. Fe(s) + I2(s) ==> FeI2(t) Fe3+ is sufficient at oxidation power to oxidize idi ion to iidid, so FeI2, not FeI3, is formed. Note that these reactions with iron also describe the halogen reactivity series. THE TOP OF THE PAGE NOTICES KS4 Science GCSE/IGCSE/O Level GROUP 7 HALOGENS NOTES are on a separate website doc brown's advanced level chemistry revision notes what next? INORGANIC Part 9 Group 7/17 Halogen sub-index: 9.1 Introduction, trends & Group 7/17 data * 9.2 Halogen migration reaction and reactivity trend * 9.3 Halogen reactions with other elements * 9.4 Reaction between halide salts and conc. 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