mane 29 PUERTO RICO NUCLEAR CENTER DISTRIBUTION OF RADIOACTIVE ANTIMONY FORMED BY NEUTRON CAPTURE IN ANTIMONY COMPOUNDS 1. J.-F. Facern SECU [OPERATED BY UNIVERSITY OF PUERTO RICO UNDER CONTRACT HO, AT (@01}-1833 FOR U. S. ATOMIC ENERGY COMMISSION ---Page Break--- ---Page Break--- ne hm HY 9.78 78 Re Neen nd DISTRIBUTION OF RADIOACTIVE ANTIMONY FORMED BY NEUTRON CAPTURE IN ANTIMONY COMPOUNDS: J.-F. Facern? Nuclear Science and Technology Division Puerto Rico Mac Cnet TMayagüez, Puerto Rico Revo 28 October 192; in red from 30 December 1962) ‘Abstract—Antimony compounds were radiated with neutrons and the distribution of radionuclides was studied. The results indicate the importance of carrying out similar studies with antimony oxides. "Antimony, having similar properties to arsenic, forms three oxides commonly written as Sb2O3, SbO, and SbO2. The irradiation of antimony gives the radioisotopes 125Sb and 121Sb, of known characteristics. A. Mates “The irradiated antimony compounds were the three oxides and potassium iodide. They were irradiated with neutrons, the Sb2O3 was separated by above and May [Centon Egan Tn] to check the crystallographic entity of the X-ray diffraction pattern were removed by the phone and conventional X-ray machine aot. By the ASTM “it was established that the irradiated Sb2O3 corresponds to the same care." The “Sb2O3 commonly has antimony oxide. The two irradiated pentoxides (Peer Scene read Rand [ESStars] id have the same structure." One of the forms is from the University of A. Manno and M. Mo MAD. Cond J. Chem. 34 4 (1950). ‘2 A. Awonsna and. Hasborue In. Na Chem. 9,300 (1999). ‘8G Muso and A. Ain ro Symp. Chel Efe

of Nichar Troformation. 1 A EA'sTeruB 34, Va 2.233008, ‘G0. Ban, Poin Unie de Bus Aire (98) ‘h . Sraemoras 3 Hottswoen snd G Season. Table € stops Rex. Ma, Phy. 3, 5 (930. vw Say Ponder Data Pe and nde to he Xray Powder Data ie 18 YK sanand M. Deana Th Sata of Moles an he Choice od DBterwor, Lode 930 sw Duar and Ar Waron, 2. An, Chem. 28, 153193). ---Page Break--- 1 reac The amounts rated wore abut 100g. iil to oan the ones pref of mt" sas yt 19 att st oe {empresa 0 age Thess woe st tech uO Pye amo od then rn “Aner compondiraiat! wat heat smal rade “otassompyrantionit” ‘The ormols Sb OM. has bon alge ob copund "Te onpls he sae {0 be flung resin (A) Oe pms se t 245 fr 20; wad wih eer a he haste 9 24° for ‘onsale nore apie 1 500 Yor 20 mi ac nth pone hoe seating (2) Anwar were ete 248 for 2th a then se eh pea: {© haa pir wore bested 150 fon 30 Store radia “The samples we radiated for 4 3.4 inthe PRN mac venr with # neon © Chia procaies Imei oF 2 aeration, the apis were ve in fae KOM ine TENG, an he SV) exe by "The smpes ete Sota mh ‘Ste SO, ont form of SO ane SHV) no cas weve dd or the sepa. ‘Toe 0; nd KSOW ere up dbus sonar Hl we . Mesiemen ndreoctete! ari Te mame in acl) agnosie selon an in he er tion were paced in cent pap or yc aera med hal i) Wheel Alter th thor ive inmershnd dey th ng ned nomers 742 day and 60 days of ‘ant Sh were mena In he naps tegen peak 057 and MeV hn Rh aed (eon 10) MeV foe Sh were neared “Pe rachel purty ws entre tlawtg {he aay ‘Sic het otra of he phot O57 Sa DED Mev the mere eee by towing th Sey aes on tn surat etaplae 0 ay acy the lange “Table | shows the dsirioution of the radioactive F486 and "Sb as SHIM) and suv}, “The yield of 64V) in both sompics of radiated antimony penton was the same and showed no apparent let oftheir dierent srucures. The distribution of 35 and Sb inthe pentavalont states essentially the same for ll he compounds studied, ‘within the experimental eros. No isotopic eects found in the chemical sate ofthe ‘mo radioactive species. in agreement with Ue published

data 'No difference exists between samples processed immediately or 24 hr after irradiation. Therefore, the isomer transition "Sb 7, 21 min presumably does not bring about an increase in the yield of the higher oxidation state. The results for Sb,0y showed nearly 99 percent retention in agreement with previously published data." Retention in Sb,0, was low and the yield of the pentavalent state in Sb,0, was that expected for an equimolar mixture of Sb,0, and Sb,0,, 1 Pau J

nr, Chom Si. $8, 1895 93, IN V. Siocwict. The Chemical Eto hr Compounds Vo... 78, Oxford (980, Bowser ie Se. MeO GM ---Page Break--- aban of ations amirmy Fred by atom captures in anion compounds 76 Fenn: Yale SNH Compounds Seen = 7 kor seve ee Wer ea pos maces tse (ote) so. Save! Koh hy Ok esar one om 4 (enw Keay) Grete Shope Kon” 3 mas as 1 (te tsb) —__fttend KsH0%n, owe? oa a . eonen “ie vreau) MES asa p26 aL 26 SH two) resent) HO Ds ms ws awo “The fasion with KOH (at 30°C) apparently did not change the distribution between the two valence states as may be seen from the results of dissolving Sb,O, in concentrated HCL. The fellows that the majority of the radioactive Sb atoms reach their final oxidation states immediately after the nuclear process or possibly a short time after. The practice has lost its kinetic energy. In terms of scaling, the fact that there is no change in the retention may be due to the short time at the high temperature in the rel. In addition, reaction between the sample and solvent must also be considered; this may impede the recombination of recoil atoms with the reagent. The neutral is a rapid reaction. In addition, the high concentration of OH in the first KOH will accelerate late degradation, with the intermediate formation of polyanionic complexes. It must also be remembered that the vacancies occur in the irradiated compounds. The results for pretreated samples of KSMOW suggest that the presence of the (OH group in the irradiated molecule adds to a greater yield of the higher oxidation states. The low yield in case (A) can be attributed to the loss of

Water from the compound. ‘Tho rolls in ave (C) sve i agreement with those recently published. It has been suggested that a linear relation exists between the yield of pentavalent radioactive arsenic and the two types of atoms in arsenic in the compound irradiated with neutrons. A similar phenomenon seems to hold for the radioactive pentavalent antimony formed in the irradiation of simple antimony compounds (See Fig. 1). This case, as in the side case of radioactive arsenic, indicates that 3.4 Atv T, Mowat e219 U9) ---Page Break--- 12 JP exer Po 1 Yi 6 SHOVK29 omg oS ati. The oxygen content of the compound is the main factor in determining the distribution of the radioactive antimony between the trivalent and pentavalent states. A significant fact is that the results for KSH(OH), submitted to pretreatment (A), fall on the linear relation at the point corresponding to the hypothetical KStO,, eloumidemess. I thank De G Raso of the Atomic Energy Commission of Argentina for his contributions and E. nana a Tous for the PRNE for assistance in the chemical separation and management. "The author wishes to thank Mansi for kindly performing the X-ray measurements and Dr. 0. Wratislaw at the PRN. Several cus ---Page Break---