

# HANDLING GUIDE FOR PLATINUM PRODUCTS

## PLATINUM LABWARE CAN BE USED FOR

- 1.) Melting
  - a.) Sodium carbonate
  - b.) Sodium nitrate or nitrite
  - c.) Sodium borate or sodium metafosfate
  - d.) Alkaline bifluorides
  - e.) Alkaline or alkaline earth-chlorides
  - f.) Alkaline bisulphates or pyrosulphates

The loss of weight of platinum in point a.) and d.) is only less than 1 milligram. Melting mixtures of nitrates and nitrites in point b.) causes a more serious loss of the weight of platinum, but at regular laboratory conditions this loss is not expected more than 1-2 milligram. Sodium metafosphate damages the metal only at extremely high temperatures and only in reducing circumstances. Over 1000°C alkaline chlorides and alkaline earth-chlorides damages the metal, because of the releasing chlorine from the melted salts. Over 700°C alkaline bisulphate slightly damages the platinum. The damaging will be reduced by adding ammonium sulphate.

- 2.) Vaporation (Steaming)
  - a.) Sulphuric acid with or without fluorine acid
  - b.) Fluorine acid
  - c.) Hydrochloric acid, salpêtre acid in presence of halogens, especially chlorides, but it is forbidden to keep hydrochloric acid or halogens salpêtre acid or other oxidizing substances together, because the releasing halogen damages the platinum
  - d.) Alkaline hydroxids and carbonates, but the pollution with their silicon compounds must be avoid
  - e.) Sodium peroxides solutions

The risk of the reaction with platinum in point d.) and e.) is very high.

- 3.) Burning (Annealing)
  - a.) Barium sulphate
  - b.) Alkaline earth-carbonates, oxalates, etc.
  - c.) Sulphates which are not reducible easily
  - d.) Oxides which are not reducible easily, like  $Al_2O_3$ , BaO, SrO,  $TiO_2$ ,  $ZrO_2$ ,  $ThO_2$ ,  $MoO_3$ ,  $WO_3$ ,  $Ta_2O_5$ ,  $Mn_3O_4$ , and in the absence of carboniferous substances: ZnO,  $Co_3O_4$ , NiO, CdO
  - e.) As quantity determination of ashes of organic substances, like for example: coke, coal or plants.
  - f.) To avoid the alloying of platinum with sulphur, phosphorus, iron etc. carbonic substances should be burned at as far as possible low temperatures by adding much air. These pollutants are present in the substance, because of the reduction of sulphates, phosphates and iron-compounds.
  - g.) To determinate the evaporating substances of combustibles. Here important, to prevent the coal loss, is to keep a non-oxidizing atmosphere. The risk of damaging the platinum is especially high, if the combustible is rich in sulphur and compounds.
- 4.) Electrolytic procedures
  - a.) Platinum, as anode, is used in the most electrolytes, except in extreme acidic halogenoid solutions.
  - b.) As cathode, it can be used for the separation of metal form acid, alkali or ammoniac solution. For the separation of zinc, gallium and bismuth the platinum previously has to be coated in a galvanic process with copper, to prevent it being alloyed with the precipitating metals from the solution.
- 5.) Platinum can be heated (ignited) without the danger of being damaged
  - a.) With air, in nitrogen, in oxygen up to the melting point of platinum
  - b.) In nitrogen oxides
  - c.) In bromine and in iodine gas
  - d.) In hydrogen

Annealing in carbon dioxide is not recommended, because  $CO_2$  easily breaks up and the leaving carbon easily attacks the platinum.

## UNDER FOLLOWING CIRCUMSTANCES PLATINUM LABWARE GET DAMAGED

- 1.) In case of heating in atmospheres containing the following gases
  - a.) In ammoniac. Its area becomes dark, matte, in short time it gets a porous and crystalline appearance
  - b.) In hydrogen sulphide, the platinum's area becomes coated with platinum sulphide.
  - c.) In chlorine, in which platinum becomes a crystalline substance, because of the steadily formation and decomposition of platinum chloride.
  - d.) Evaporating, especially dissociating chlorides.
  - e.) Particularly in carbonic gases and steams, which dissociates the platinum, probably because of the fragile platinum carbide's formation.
  - f.) Never heat Platinum Labware in the reductive zone of the gas flame.
  
- 2.) In case of heating in the following liquids
  - a.) Aqua regia or systems establishing aqua regia (e.g.: chloride +  $\text{cHNO}_3$ , nitrate +  $\text{cHCL}$ ).
  
- 3.) In case of heating with the following molten or gaseous bodies
  - a.) Sulphur, selenium and tellur. The influence of sulphurus steams is extremely slow and a serious influence is only visible after a very long time of heating. Selenium and tellur easily alloy with platinum.
  - b.) Phosphorus, arsenic, antimon. The alloyage starts already at red heat.
  - c.) Magnesium-pyrophosphate over  $900^\circ\text{C}$ .
  - d.) Silicon and borax on high temperatures.
  - e.) Molten lead, zinc, tin, bismuth, silver, gold and copper or alloys and decomposing salts of them, which proceed by the reduction of these metals.
  - f.) Molten alcaline oxides and peroxides are very damaging. Alkaline hydroxides in presence of air.
  - g.) In presence of molten nitrates, alkaline hydroxides or carbonates. The influence on platinum is very pernicious.
  - h.) The influence on phosphorus pentoxide and phosphorous acid is relatively small.
  - i.) Molten cyanides, when platinum cyanide comes into being.
  - j.) Ferro oxide over  $1200^\circ\text{C}$ , because oxygen evolves and the iron alloys with the platinum.
  - k.) Silicon, silicates, aluminium and magnesium oxide over  $1000^\circ\text{C}$ . On lower temperatures these have no influence on platinum.
  - l.) Molten alcaline chloride over  $1000^\circ\text{C}$ .
  - m.) Lead and bismuth oxide at  $1250^\circ\text{C}$ , but also under  $1250^\circ\text{C}$ , particularly in presence of reducing substances.

## PLATINUM LABWARE CLEANING

**Mechanical cleaning** with salt by scrubbing with several times boiled out, finely sifted (DIN 80) wet sea sand, which can only remove the dirt on the surface. Possibly caused deformations, by the use of the Labware, it is not recommended to repair by your self, because it can cause an undoing. In this case it is useful to bring intermittenly the Labware to our company for remoulding it, hereby the Labware's lifetime can be multiplied.

**Chemical cleaning** of Platinum Labwares may be done with boiling it in hydrochloric acid. Then smelt sodium carbonate  $\text{Na}_2\text{CO}_3$  and potassium carbonate  $\text{K}_2\text{CO}_3$ , in proportion 1:1, and pour it out. After that fill it with potassium or sodium, with hydrogen sulphate  $\text{KHSO}_4$  or  $\text{NaHSO}_4$  or pyrosulphate  $\text{K}_2\text{S}_2\text{O}_7$  or  $\text{Na}_2\text{S}_2\text{O}_7$ , then smelt and pour it out again. You can repeat these alternately, if necessary.

Do not cool down the hot Labware in cold water, wait till it cools down to the room temperature.

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