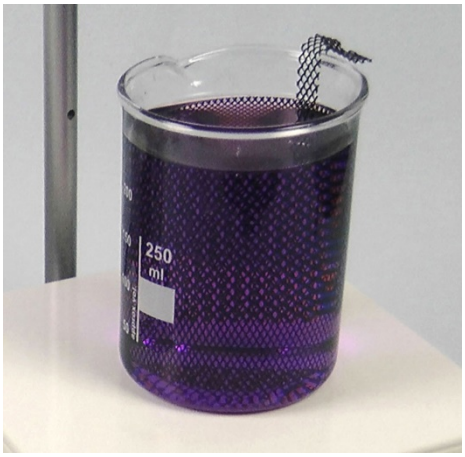
Materials for Plating 25 cm* 25 cm Ti plate

Equipment/Material	Quantity/ volume needed	Justification/usage
General equipment and plating tank components		
Magnetic stirrer	3	To heat and apply agitation during different stages of plating. In our process agitation was most important during: • Degreasing Stage • Electro cleaning Stage • Platinum coating stage (at low speed)
Fume hood	1	To prepare solutions such as preparing pickling/nickel strike solution
Plating Rectifier	1	A plating Rectifier is used. It is able to control the voltage and current to the plating tank. To plate 25 * 25 cm^2 Ti plate at a current density of 30 mA/ cm^2 a rectifier capable of providing an output current of 18.75 A (Assuming only one side is to be coated)
Beaker Ring	1	In our experiment a beaker link capable of holding the anodes are used for the Acid Pickling/ Ni-strike and platinum plating stage. The Rod anodes are assembled and hocked into the beaker ring during the operation and the positive terminal is connected to the beaker ring. 

Anodes Bag	For all anode electrodes	To trap the gas bubbles that are generated on the electrodes, which stops them from getting into the solution and to filter the flow coming from the anode. Those will greatly reduce the risk of contamination or pitting of the plating tank. The anode bags should be long enough to cover all the anode electrode surface that in contact with the solution in the tank. Product Link: Anode Bag - Spa Plating: gold plating kit (goldn.co.uk)
Degreasing pre-treatment stage		
Spray Alkaline Degreaser	-	To perform the first stage of sample degreasing. Any alkaline degreasing spray solution can be used for this stage. The sample is sprayed and left for few minutes and then washer thoroughly with deionized water.
Caswell SP degreasing powder	60g/L of solution	The second stage for degreasing is by using SP powder to preform degreasing step in hot plate (at 90-95 ºC). Product Link: SP DEGREASER - 2 LBS - Caswell Inc (caswellplating.com)
Electro-cleaning stage		
Electro-cleaning solution	5 L	An alkaline based solution used to electro clean the surface of the Ti plate before pre-treatment stage. A wet-out or water break test must be preformed after this process to ensure the material is ready for plating. Product Link: Electro-Cleaner Solution - Bath or Brush – Gold Plating Services The solution can be used until the solution colour change (from yellow to colourless) or the solution is contaminated. Therefore, all traces of polishing, grit blasting or dirt particles should be removed and cleaned in the spray degreasing and SP degreasing steps to avoid contamination the solution.
Mesh Electrode	1	Ti grade 1 mesh is used as the anode for the electro cleaning step. The mesh is capable of covering all sample area and make sure all the area is cleaning from any residue. The mesh must be large enough to cover all the beaker area. Product Link: Mesh Electrode Custom Sizes - Spa Plating: gold plating kit (goldn.co.uk)

		
Pickling and Nickel strike stage		
Concentrated HCL and Additive N – wood nickel strike base solution	5L	To prepare 5L pre-treatment solution, a 0.5 L of Additive N Ni-strike solution is needed to be mixed with 4.5 L of concentrated HCL (37%). Product Link: Additive N - Wood Nickel Strike Concentrate for International Customer – Gold Plating Services
Anode Electrode (Ni Rod or Mesh Electrode)	-	In our experiment, Ni rod electrode was used as the anode for the Ni-strike pre-treatment step. The specification of the Ni anode to be used for 5L should be as follows: • Length: 25 cm or longer • Diameter: 8 mm • Number of electrode: 6 Anode bag must be used in this step since Ni is not stable in this environment and will corrode and contaminate the bath. Another option that can be considered is using a mesh electrode similar to the one in the electrocleaning step. However, the Ni content must be replenished to replace the consumed one.
Platinum plating stage		
Platinum Tank Plating solution HB (Spa Plating)	5 L	A platinum solution having 10g of Pt/L concentration is used. However, before using the solution Sulfuric acid must be added to activate the solution for plating by adding 20 ml of 30-35 H_2SO_4. Product Link: Platinum Tank Plating Solution HB (Available worldwide) - Spa Plating: gold plating kit (goldn.co.uk)

Platinum Tank HB Replenisher (Spa plating)	-	Replenisher (having a concentration of 20 g of Pt per L) is used to replace consumed platinum in the plating tank and to ensure constant solution concentration for all samples. If a 25 * 25 cm Ti plate is plated (one side) at 30 mA/ cm^2 for 19 min to produce a 2 µm plating thickness, then the platinum used is as follow: • Weight of Platinum used: 2.7 g • Volume of Platinum Replenisher to add: 107.5 ml • Turnover rate until exhausting: 30-40 grams of Pt After turn over rate is reached (30-40 grams of Pt is used to replenish the consumed Pt), a new solution needs to be used. Therefore, for 5L (50 grams Pt) 150-200 grams from replenisher can be used (8-9 Liter of replenisher solution can be used). Product Link: Platinum Tank HB Replenisher (Available worldwide) - Spa Plating: gold plating kit (goldn.co.uk)
Platinum or Ti-platinized anode electrodes	4	Provide more stable performance and eliminate contamination, the use of anode bags in this step is also recommended. The specification of the Pt anode to be used for 5L should be as follows: • Length: 25 cm or longer • Diameter: 8 mm • Number of electrode: 4 Product Link: Platinum Rod Electrode for Beaker Plating - Spa Plating: gold plating kit (goldn.co.uk)