

# VELO UPGRADE – FOILS- electroplating - Aluminium???

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# How could we use a plating process

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- Produce a CNC milled mould
- Cast a low melting point alloy into the mould
- Plate the casting with 200um Al
- Melt out the LMP alloy
- OR
- Cast a wax former and coat with graphite?
- OR coat master with graphite – or plate with indium
- OR-----????



# Electroplating aluminium – How?

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- It is not possible in an aqueous process
- It IS possible in organic solvents and in ionic liquids
- Only one commercial vendor identified so far - (Alumiplate Minnesota USA ) <http://www.alumiplate.com/index.html> uses a proprietary process involving Toluene as the base solvent.
- On initial enquiry Alumiplate people are interested and positive
- OR -----



# Using Ionic Liquids

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- Essentially are ionic salts that are liquid at room temperature
- Think of sodium chloride where the sodium is replaced by urea and the chloride by vitamin B4 – this is a real ionic liquid which can be used for electroplating various metals when metal salts are added .
- Hundreds of different types of ILs are manufactured –BASF - also -----
- Leicester University Ionic liquids (LIL) group have a spin out (Scionix) aiming to commercialise some of their compounds in the plating industry.
- Cannot identify a commercial vendor so far who is using this technology but LIL group have a demonstrator facility <http://www.leicester-ils.co.uk/enterprise.html> but it is unlikely they would be able to process the final size of foil.
- Would probably need a commercial plating company – (or CERN?) involved to use the process as anhydrous aluminium chloride is most likely salt and would emit chlorine in the processing.



# Some possible problems

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- Castings may need to be done in vacuum to avoid voids
- Surface finish of casting
- Compatibility of LMP alloys with solvents/reactants
- Shrinkage of LMP casting initially and over time -  
compensate? <http://mcpmetspec.thomasnet.com/item/low-melting-point-alloys/mcp200-metspec-390/item-1012?>
- Pure aluminium is very soft – can we plate an aluminium alloy? – would anodising help to stiffen?
- Consistent deposition/anodising over a large area – maybe a shaped anode/cathode would be needed.
- Elevated process temperatures needed  $\sim 100$  C or very slow deposition rate due to low ion mobility (syrupy liquid consistency)



- Could plate the aluminium master after coating with graphite as a release layer  
(PCB plated through holes use graphite dip)
- Plate the master with indium and melt to release?
- No problem with different CTEs or shrinkage
- Releasing from the mould without distortion may be problematic....



- Aluminium plating is possible but not commonly available .
- Ionic liquid process is in early stages.
- Significant R&D required.
- May need industrial partners.
  
- Could be fun!