## Paint Baking

Paint baking is a process in which an aluminum product is coated with any number of layers of paint, primer, and clear coat at elevated temperatures. Generally, the paint bake cycle in the automobile manufacturing involves three stages: [3, The effect of cold work on the precipitation kinetics of AA6111 aluminum, pg. 6495]

* Electro-deposition coating (10-20 min curing at 170-185°C) [2, Electro-Deposition Coating, pg. 10][4, Coatec India]
* Electro-deposition coating resembles the process of electrowinning. The metallic parts to be coated are electrically charged, then immersed in a bath containing oppositely charged pigment particles. The electrostatic force generated through the process allows the particles to be deposited onto the metal surface. There are two types of electro-deposition: anodic and cathodic. Current practice favours the cathodic system. In cathodic electro-deposition, the body parts are made negative electrode, which attracts positive charged pigment particles. The reversing of anodic polarities greatly reduces the amount of ions entering the cured paint film, which results in superior performance properties as well as better corrosion resistance. After the deposition process, the body parts are cured at 165-180°C.
* Primer coating (15-20 min curing at 160-170°C) [2, Electro-Deposition Coating, pg. 14]
* The primer layer is the coating layer that joins the electro/powder coat to the top/clear coat. Its purpose is to smooth out surface irregularities in order for the top/clear coat to be applied properly. Also, the primer layer helps to protect the substrate from UV light. The primer layer is applied after the electro/powder coat. After the primer coat is applied, it is sent to the oven for 30 min at 170°C. Before moving to the clear coat process, the parts are wet sanded, rinsed, and dried off. A preparation area is used for manual wipe down, compressed air blow-off and deionised air application.
* Top/clear coat process (15-25 min curing at 130-150°C) [2, Electro-Deposition Coating, pg. 14][1, Dupont Paint & Coating for Metal Exterior]
* The body parts move through a clear coat application booth. Then, it is baked in an oven for 30 min at 160°C. The purpose of the clear coat is to protect the vehicle from any environmental degradation. It must be etch ad scratch resistance, as well as providing an appealing glossy finish.

## References

[1] Dupont Paint & Coating for Metal Exterior <http://www2.dupont.com/Automotive/en_US/products_services/paintCoatings/metalExterior.html#Electrocoat>

[2] Painting Makes the Difference  
<http://www.drishtikona.com/books/automobile-manufacturing/ch7.pdf>

[3] The effect of cold work on the precipitation kinetics of AA6111 aluminum <https://springerlink3.metapress.com/content/n84250x387508h41/resource-secured/?target=fulltext.pdf&sid=uxo0hvexyw0x54rgpnc4cxsa&sh=www.springerlink.com>

[4] Coatec India Cathodic Electrocoating

<http://www.coatecindia.com/cathodic_electro.php>