BUCK Scientific

Application Note #LC9003

Analysis of Organic plating Bath Additives and Chemicals by Isocratic HPLC

In today's world, over 75% of all metal surfaces on manufactured metal "items" have some sort of plated finish on them. From high-chromium steel car bumpers to zinc diecast toys to Silver-contact electronic components. While the primary composition of these plating baths are inorganic (the metals and salts that are used to make up the desired metal finish), almost all types of plating baths; from alkaline cyanide to acid sulfate to neutral borate, and so on; employ some sort of organic chemical to improve the quality or characteristics of the plate. These compounds are added to the bath in a certain concentration range to control the hardness, brightness, shine / matte texture, conductivity, density, etc.; of the final product. There are as many "recipes" for these additives as there are companies that make plating chemistries; but they all employ the same type of basic organic compound.

By having several of these organic compounds together in a fairly complex mixture, it is difficult to use a simple "bulk" measurement technique; such as UV-Vis spectrophotometry or IR spectroscopy, to both identify and quantitate these materials. High-Performance Liquid Chromatography (HPLC) is ideally suited for this type of analysis, since the inorganic materials will not interfere with the separation of the different organic materials on the HPLC Column and then the measurement of the individual organic compounds by the sensitive HPLC Detector. Materials such as sugars, saccharines, sulfonic acids, sulfamic acids, anionic surfactants, Cationic surfactants, poly-ether wetting agents, amine-based hardeners, poly-alcohol based brighteners and many, many others can be easily analyzed by one or two simple HPLC methods.

An example of the material used in a nickel-cobalt bath is shown on the back. The procedure was very simple, consisting of the following steps:

(1) Pipet 1ml of Bath into a small test tube.
(2) Add 3ml of methanol-acetonitrile solvent mixture, swirl to mix.
(3) Add 1ml of 0.05M sodium phosphate buffer, swirl to mix; pass through a syringe filter to remove any particulate matter.
(4) Load the sample loop of the HPLC with a 100uL syringe.
(5) Inject the sample and record the peaks that come off the system.
(6) Compare to a standard to identify and measure the amount of additive present in the plating bath.

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Method: Direct injection, 100uL
Description: BLC-20D HPLC
Column: 15cm x 4.6mm C-18
Carrier: MeOH-AcCn-H2O
Sample: Additive "Standard"
Operator: Dr. Jerry DeMenna
Comments: This run is a mixture of 1% each of the additives submitted for analysis.
Pump solvent flow and detector wavelength were optimized for these chemicals.

Number	Component	Retention	Area	External Units
1	Na-Saccharin	6.233	41289.694	1.01%
2	Sulfamic Acid	8.066	7506.532	1.00%
3	SNAP-Am	8.666	9426.624	0.99%
4	"non-ionic" soap	8.900	1521.504	0.00ppm

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1-800-562-5566

58 Fort Point Street East Norwalk CT 06855
Tel: 203-853-9444 Fax: 203-853-0569
www.bucksci.com sales@bucksci.com