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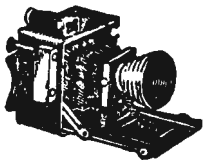

The Development of Friction Ridge Detail on a Class of Counterfeit Currency

(This original article was submitted by SCAFO member, Vici Inlow. Thanks, Vici and David, for sharing this information.)

By DAVID LLOYD
Fingerprint Specialist
United States Secret Service

Abstract: Physical Developer is routinely used to develop latent friction ridge detail on porous and semi-porous items. Physical Developer is a multi-step process that uses water-based solutions. Items that are produced with two pieces of paper and then secured together to form one piece are sometimes separated during processing. This separation allows for the detection of latent friction ridge detail on the protected, interior surfaces of the evidence.

Introduction

Counterfeit Federal Reserve Notes (FRNs) are produced for financial gain to the counterfeiters and/or their organization by passing the counterfeit FRNs within the general public for goods and services. These FRNs are generally detected by businesses or banks who then notify the U.S. Secret Service – an agency whose mission includes the protection of the integrity of the financial obligations of the United States of America.

As the counterfeit currency (FRNs) is passed through the public, it is handled by a great many people. Extensive handling and exposure to adverse conditions (i.e., moisture, extreme temperature changes, contaminants) also challenge the Fingerprint Specialist's ability to develop identifiable latent prints.

In January 2000, a case with approximately 10,100 counterfeit $100 FRNs was received as a result of an investigation of a foreign crime syndicate. It was determined that this class of FRNs was created by printing them on two pieces of paper, then securing the two pieces of paper together to allow for the placement of a security strip between the two pieces of paper to mimic that of genuine currency. These FRNs were subsequently submitted to the Forensic Services Division of the U.S. Secret Service for latent print examination. The counterfeit FRNs were processed for latent prints with Ninhydrin solution and then subsequently with Physical Developer[1], the most frequently used reagents on counterfeit documents by the U.S. Secret Service.

Methods

Ninhydrin (0.6% w/v)

120 grams ninhydrin crystals
1-liter 200-proof ethanol
Mix together and dissolve the ninhydrin crystals.
Add 19 liters petroleum ether.
Agitate to ensure solution is mixed well.

Procedure: The FRNs were dipped and then allowed to air dry. When completely dry, the FRNs were placed in a humidity chamber set for 60% humidity at 60 degrees Fahrenheit for at least 45 minutes, or until Ruhemann's Purple reaction was observed. It should be noted that the evidence should be periodically checked to monitor the development as some items develop prints quicker than others and over processing can occur.

Physical Developer

MALEIC ACID PREWASH:

1. One liter of distilled water.
2. Dissolve 25g of maleic acid in water.
3. Solution should be clear and colorless.
4. Store in glass or polyethylene container.

REDOX:

There are three stock solutions that are needed in order to make Physical Developer. One solution is a reduction-oxidation (REDOX) solution that reduces the silver nitrate to its metallic state (silver) as the iron is oxidized from the ferrous/ferric redox solution. The reduction of the silver occurs rapidly; however, the detergent/surfactant solution, added to the Physical Developer solution, prevents the uncontrollable reduction of silver into the solution. This enables the silver to slowly deposit onto the material it's reacting with, allowing the specialist to cease the development by rinsing the evidence with cold tap water.

1. Measure 900ml of distilled water.
2. Dissolve 30g of ferric nitrate in water.
3. Dissolve 80g of ferrous ammonium sulfate in above solution.
4. Dissolve 20g of citric acid in above solution.

NOTE: Each chemical must be thoroughly dissolved before adding the next chemical.

DETERGENT:

1. Measure one liter of distilled water.
2. Dissolve 4g n-dodecylamine acetate in water.
3. Dissolve 4g or 4ml of Syperonic-N in the above solution.
4. The solution can be stored in a clear glass container.

Detergent solution may appear cloudy; however, make sure the solid substance is completely dissolved.

SILVER NITRATE:

1. Measure 100ml of distilled water.
2. Dissolve 20g of silver nitrate in water.
3. Store solution in amber bottle.

PHYSICAL DEVELOPER:

The following formula is used to make approximately one liter of the working solution of Physical Developer:

900ml of redox solution

40ml of detergent/surfactant solution

50ml of silver nitrate solution

Mix the detergent solution with the redox solution thoroughly and then add the silver nitrate solution. The detergent solution must be mixed before the silver solution; otherwise, the silver will not stay suspended in the solution.

Procedure: The FRNs were placed into trays containing distilled water, agitated on orbital shakers for approximately 15-20 minutes. It should be noted that the FRNs should not be crowded into a tray, as they must freely move within the solutions in order to achieve the best results and allow monitoring of latent print development. The distilled water was then removed and the FRNs agitated in the Maleic Acid solution for 20-30 minutes. These two steps remove the Ninhydrin stains and other contaminates that may be present. The FRNs were then placed in the Physical Developer working solution for approximately 30 minutes, or until latent print development was observed. The Physical Developer was discarded; the FRNs were rinsed several times in tap water to remove the excess Physical Developer. The FRNs were placed on blotters to remove the excess water, and then dried on a photographic paper drum dryer.

When working with these solutions, dispose them in a manner that is within your jurisdiction's environmental and disposal guidelines.

Results

The processing resulted in the development of one hundred thirty-nine (139) latent prints on the exterior surfaces. However, it was noted that during the Physical Developer process, the FRNs would partially separate in the aqueous solutions, into two pieces, generally near the implanted security strip. After the FRNs were dried, those that had not previously separated in the aqueous solutions were gently pulled apart. It was then observed that an additional five hundred forty-seven (547) latent fingerprints had been developed on the interior surfaces

(some latent fingerprints could be seen on the interior surfaces of the separated FRNs while still in the physical developer working solution). See Figure 1.

Figure 1

Counterfeit FRN showing partial separation of glued pieces of paper. Note development of latent print on the protected inside surface.

The advantage of the subsequent Physical Developer examination was the development of the latent prints on the inside, or protected surfaces of the FRNs, which could not have been placed there by casual contact or as result of receiving the counterfeit as change from a business or trade transaction.

Conclusion

This one case dramatically shows the success that the U.S. Secret Service has had using Physical Developer for developing latent prints on currency. It is the continuous success that makes this technique valuable in the identification and apprehension of counterfeiters.

For further information, please contact:

Fingerprint Specialist David Lloyd
United States Secret Service
Washington, DC
(202) 406-5283

Reference

[1] United States Secret Service, Procedure Manual for Latent Print Examinations.

The Effects of Aluminium Fingerprinting Powder on the Health of Scenes of Crime Officers

(This article is reprinted from vol. 28, no. 108, April 2002 issue of Fingerprint Whorld. Thanks to Kurt Kuhn for submitting this article.)

By **RICHARD CARRUTHERS**
H.N.D., B.Sc. (Hons.), P.G.C.E.
Leicestershire Constabulary

EXECUTIVE SUMMARY

This project deals with aluminium and any possible effects on the health of humans with particular reference to the use of aluminium fingerprinting powder, which Scenes of Crime Officers use. It's not surprising that aluminium, being the third most abundant element in the earth's crust, can be found in the human body. The metal may enter our bodies via inhalation or by diet. The main sources of aluminium in our diet include tea, beer, baked products, drinking water, toothpaste, aluminium-based antacids, aluminium cookware and some canned beverages. It has been well documented that the average daily intake or aluminium from food by UK adults is well below internationally recognized safe limits and that aluminium uptake from our diets is usually very low, with more than 99% passing through the digestive system unabsorbed. Studies have provided support to the suggestion that absorption is increased significantly in the presence of acidic foods such as orange juice. Aluminium cookware is generally considered safe to use, although the use of acidic food in them may release more aluminium into the diet. The small amount of aluminium that is absorbed into the body is rapidly excreted as urine by the kidneys. It is believed that aluminium could play a role in the cause of leukaemia and cancer of the lung, bladder, and pancreas. It is also a hot debate as to whether aluminium is responsible for the cause of Alzheimer's Disease. Alzheimer's Disease is a degenerative condition resulting in dementia, occurring mainly in the elderly. Aluminium has been suggested as a possible cause of, or risk factor for Alzheimer's Disease due to its presence in the brains of Alzheimer's Disease patients. The proposed link between dietary aluminium intake and Alzheimer's Disease is still the subject of considerable debate. However, no causal relationship has been established, and accumulation of aluminium in the brain may be a natural part of the disease process. Recent studies have reported the identification of various genes associated with Alzheimer's Disease, suggesting that sufferers may have a genetic predisposition to the condition and that aluminium does in fact bear no relevance to the cause. Other studies have ruled out aluminium as the causal agent of cancer, however, there is some evidence to suggest that aluminium powder can cause lung fibrosis, this has been reported as very rare. The results of this project suggest that there is no need for any healthy adult to alter their lifestyle in any way on the account of aluminium. There is no convincing scientific evidence for a link between aluminium and mental illness. This project will provide background on aluminium, outlining it uses in industry, medicine and domestic life. Case histories will be briefly examined to highlight the possible ill effects of aluminium on humans in the past. The project will also seek to determine, through thorough research, the relevance of aluminium in the development of Alzheimer's Disease and other medical conditions. The use of aluminium in the field of Scenes of Crime will be outlined. As a means of reducing the potential health risks to scenes of crime officers, the importance of safety procedures when using aluminium powder in scene examination will be stressed.

1. INTRODUCTION

Aluminium is a common metal in the Earth's crust, but, due to the difficulty of extraction, only recently has it been available to the body in an absorbable form. Because of its qualities aluminium can be found all around us, in many chemical forms, in every day life. It has many uses in industry and medicine, bringing human beings into contact with it on a daily basis. It is now used extensively in cookware, and packaging materials such as aluminium pots, pans, cans and wrapping foil. Aluminium compounds can be found in table salt as an anti-caking ingredient, and is sometimes added to water to improve clarity. Aluminium compounds are also used as an emulsifier in cheese processing; as a major ingredient in antacids; and as an addition to flour to bleach it. Aluminium may also be present in deodorants and antiperspirants. It has long been discussed that aluminium has an effect, in the long term, on the human body. Reports of ill health in the aluminium industry have commonly been associated with long-term exposure to aluminium in one form or another. Many case histories have shown that aluminium, in its various forms, has been regarded as responsible for ill health. Research has shown that aluminium contributes to the onset of Alzheimer's Disease, but is not yet proven to be responsible for the cause (pers. com.). It is believed by some that aluminium could play a role in the cause of leukaemia and cancer of the lung, bladder, and pancreas. Aluminium is used in its powder form to reveal fingerprints, it is used extensively by scenes of crime officers almost every day. The aim of this project is to determine if there are any ill-effects on the health of humans, but specifically scenes of crime officers through continual use of aluminium fingerprinting powder. This project will provide background on aluminium, outlining it uses in industry, medicine and domestic life. Case histories will be briefly examined to highlight the ill effects pos-

sibly caused by aluminium on humans in the past. The project will also seek to determine, through thorough research, the relevance of aluminium in the development of Alzheimer's Disease and other medical conditions. The use of aluminium in the field of Scenes of Crime will be outlined. As a means of reducing the potential health risks to scenes of crime officers, the importance of safety procedures when using aluminium powder in scene examination will be stressed.

2. BACKGROUND

2.1 BACKGROUND ON ALUMINIUM

Aluminium is most commonly seen as the bright, lustrous metal from which aeroplanes, train carriages, and the bodies of some cars are made. It is a common metal with thousands of uses, but its history of commercial production only goes back about a hundred years. Aluminium is the third most common element, and by far the commonest metal in the Earth's crust (the part of Earth that can be readily examined). Aluminium compounds were used in the ancient civilizations in pottery making. The Assyrians used alumina for pottery and in ancient Egypt there are also references to the additional use of alumina as a chemical for dyes and in medicines, (Hughes, 1992). The word aluminium comes from the Latin word *Alumen* which is probably potash alum. Aluminium is never found naturally as the bare metal but combined with other elements into many diverse compounds. It was discovered by Sir Humphrey, (Hughes, 1992).

2.2 USES IN INDUSTRY

Aluminium is a light weight, strong, non rusting metal that has been exploited for use in industry. It can be found in every day items such as window frames, vehicle bodies, and in pots and pans used in cookery. It can also be found in wrapping foil used to wrap prepared food. Not all toothpastes have aluminium in them, but many do, since hydrated aluminium oxide is an excellent cleaning agent, (Hughes, 1992). Some drink cans are made of aluminium having a coat of lacquer to separate the contents from the metal. Cans are likely to be recycled as the price of aluminium makes this efficient. Food and beverages contain aluminium naturally, but aluminium is used as an additive in the food industry for its various qualities. Fireworks contain aluminium in powder form due to its explosive properties. Aluminium powder, in flake form, is used as a fingerprinting dust in the police world wide.

2.3 USES IN MEDICINE

Medical practitioners of the world prescribe large amounts of aluminium salts to their patients, and have been following what they believe to be a safe and satisfactory practice for over fifty years, (Hughes, 1992). Many 'by mouth' drugs are available over the counter without prescription. The main intake of aluminium salts in medicine arises from the prescription of aluminium hydroxide for the treatment of two conditions. These salts of aluminium are used as antacids for patients with peptic ulcers of the stomach, and also as 'phosphate binders' in cases with long standing kidney failure. There are many other uses of aluminium both by mouth, and topically applied to the skin and body cavities. There are minor medical uses of small amounts of aluminium compounds by injection.

2.3.1 ALUMINIUM IN ANTACIDS

The stomach is protected from the digestive acids by a lining. When this lining fails to protect the stomach a peptic ulcer may arise causing irritation and inflammation. Peptic ulcers heal with difficulty because of the acidity of the stomach. Aluminium hydroxide neutralizes the acid, which prevents further development of the ulcer. Nowadays, stomach acidity is reduced using other chemicals, although as Hughes (1992) states, large quantities of aluminium hydroxide are still prescribed.

2.3.2 ALUMINIUM AS PHOSPHATE BINDERS

The second largest use of aluminium salts by mouth is to prevent the body building up high levels of phosphate in chronic renal failure The kidneys act as filters for the body, they excrete and balance the levels of chemical compounds in the body. When the kidneys fail, the body is unable to get rid of phosphates. The result is a loss of mineral from the bones (osteoporosis) which leads to brittle bones. Fractures are easily caused and the spine can collapse in severe cases Aluminium hydroxycarbonate can be administered by mouth to prevent the uptake of further phosphates from the diet and so prevent osteoporosis. The long term use of this medicine for patients with renal failure has the tendency to increase the body store of aluminium. However, the use of renal dialysis excretes excess aluminium. Aluminium compounds are also used in buffered analgesics, antidiarrhoeal agents. and antiperspirants, (Greger from Derek, 1992).

2.4 USES IN DOMESTIC LIFE

A large quantity of our food and drinks contain aluminium naturally, some foods have it as an additive. Aluminium compounds are added to food and drinks as buffers, neutralizing agents, firming agents, stabilisers, thickeners, curing agents, texturizing agents and bleaching agents, (Hughes, 1992). Milk, butters, cheeses and yogurts, have low levels of aluminium but processed cheese has it added during manufacture because of its emulsifying nature. These emulsifying formulas give a soft texture to the cheese and allow easy melting, (Hughes, 1992). Vegetable foods have higher values of aluminium than animal products. This is due to the direct contact with soil which will raise the content considerably. Pickled foods can have aluminium in the form of a firming agent (although aluminium is being replaced by calcium oxide).

Herbs and spices can have a particularly high aluminium content, for example, thyme may contain over 200mg per 100g and a teaspoon of cayenne pepper 4mg. Common salt for use in cooking or at the table has a problem of 'caking' (hardening). The addition of sodium aluminium silicate, aluminium calcium silicate, or hydrated sodium calcium aluminosilicate prevents this 'caking' in salt and may also be used in other dry powdered products. Drinks show a great variation in aluminium content, for instance, tea plants take up aluminium with high concentrations in the leaves, therefore, a habitual drinker of tea will be ingesting higher quantities of aluminium, (Hughes, 1992). However, most of the aluminium in tea leaves is insoluble, (Greger, from Derek, 1992). The average daily intake of aluminium from food by UK adults is estimated as 3.9mg which is well below internationally recognized safe limits, (Greger, from Derek, 1992). Aluminium uptake from our diets is usually very low, with more than 99% passing through the digestive system unabsorbed, (Greger, from Derek, 1992). Many foods accumulate statistically significant amounts of aluminium when cooked or stored in aluminium pans, trays, and foil as compared to similar batches of food processed in stainless steel containers, (Greger, from Derek, 1992). The amount of aluminium entering food and beverages from cookware and containers is negligible except for a few foods, mainly acid, which dissolve the unprotected metal, (Hughes, 1992). All naturally occurring water contains aluminium. Acid from pollution will have an effect on standing water such as lakes, and reservoirs. Acid dissolves and brings aluminium salts into solution, thus the aluminium content rises. In this way the inert aluminium compounds in the clays lining the rivers yield soluble aluminium salts into the water supply. Aluminium in the form of aluminium sulphate, is added to a water supply, usually in a treatment works, to remove suspended solid material in the water. Although the aluminium sulphate (acid) is neutralized by addition of lime (alkaline) the aluminium content of water can vary across the board.

3. ANALYSIS

3.1 THE ILL EFFECTS OF ALUMINIUM ON HUMANS: CASE HISTORIES

There have been a number of scientific studies over the years on the toxicity of aluminium in humans. The few cases of aluminium toxicity that have arisen were due to the unusual circumstances of renal dialysis. Dialysis Encephalopathy Syndrome (D.E.S.) (which is also called "dialysis dementia") is a usually fatal condition which has occurred in some of the kidney dialysis patients whose blood levels rose to 7400 nmol/litre or above when their dialysis fluid contained large amounts of aluminium. D.E.S. has now been largely eliminated because current treatment protocol requires removal of aluminium from dialysis fluid. A number of years ago workers in the aluminium smelting factories and the aluminium powder factories showed signs of disorders such as lung disease and bladder cancer which have attracted interest through concern.

3.2 ALUMINIUM PRODUCTION PLANTS

Primary aluminium production plants are located in about 40 countries. The two main methods used for aluminium production are called Söderberg and prebake, which encompass a number of processes and job categories. It is believed that the fumes and dust given off during manufacture are potentially harmful, resulting in the ill health of a few workers. Substantial exposures to fumes and dust, specifically airborne polynuclear aromatic compounds, have been measured in certain occupational areas in this industry. Exposures were found to be higher in potrooms of plants using the Söderberg process than in those using the prebake process; some workers may have been exposed to both processes. Exposures to fluorides and a variety of other contaminants also occur in potrooms. A number of reported cases have lead to the further study of aluminum and its potential harmful properties. Experiments have been carried out to determine any ill effects from the fumes and dust given out during manufacture of aluminium in factories. Two samples of fumes ands dust (airborne particulate polynuclear organic matter) from an aluminium production plant were tested for carcinogenicity by skin application to mice, resulting in a high incidence and early appearance of cancerous skin lesions. Studies have provided limited evidence that certain exposures in the aluminium production industry are carcinogenic to humans, giving rise to cancer of the lung and bladder. It is believed that a possible causative agent is pitch fume. However, because of the incomplete characterization of the samples tested, no evaluation of the carcinogenicity to experimental animals of complex mixtures that occur in the aluminium production industry could be made. The available evidence indicates that certain exposures in the aluminium production industry are probably carcinogenic to humans. This evidence supports the theory that aluminium does not cause cancer.

3.3 THE RELEVANCE OF ALUMINIUM IN THE DEVELOPMENT OF ALZHEIMER'S DISEASE

The main concern in the minds of the general public is whether aluminium causes Alzheimer's Disease. More than half of all serious mental illnesses is due to Alzheimer's Disease, (Hughes, 1992). Alzheimer's Disease is an illness that causes progressive cognitive impairment. It is a treatable, but not yet a curable, disease.

Memory, particularly the capacity to retain new information, is the most affected. However, other cognitive functions, including orientation, language, judgement, social functioning and the ability to perform tasks, also deteriorate as the disease progresses. Reisberg (1983), stated that there are changes in the brain tissue, specifically the formation of amyloid plaques and neurofibril-

lary tangles and the loss of brain cells, that lead to the impairment of these brain functions. Amyloid plaques are microscopic clumps of material deposited in the substance of the brain between nerve cells. Neurofibrillary tangles are clumps of material that form within the nerve cells. The illness is strongly associated with age; it is uncommon before the age of fifty, but may affect as many as half of all the people who live into their nineties, (Reisberg, 1983). Alzheimer's Disease was first described by the pathologist Alois Alzheimer in the early years of the twentieth century. Experts have concluded over the last ten years or so, that Alzheimer's Disease is in fact a disease, in which degeneration of brain cells results from one or more genetic and/or environmental factors, (Reisberg, 1983). There is much research into the causes of the disease and particularly into ways of reducing the impact of the disease. It is interesting to note that some, but not all, environmental studies have shown a greater incidence of Alzheimer's Disease in localities which have high levels of aluminium in drinking water. Risk factors that have been identified on the development of Alzheimer's Disease are: increasing age, family history of dementia, less education, and inheritance of certain genes, (Reisberg, 1983) Whilst no one factor can predict the development of the illness, this information can be important for research. Reisberg (1983), goes on to say that it is clear that there are some families that have a very strong genetic component to the disease.

3.3.1 DOWN SYNDROME AND ALZHEIMER'S DISEASE

Down syndrome is a very strong risk factor for Alzheimer's Disease. Individuals with Down syndrome have an extra copy of chromosome 21. The gene for the amyloid precursor protein resides on chromosome 21, so individuals with Down syndrome have an extra copy of this gene, in effect they have a fifty percent greater capacity than others to generate amyloid precursor protein. Since this is the source of beta-amyloid protein, the primary constituent of the amyloid plaques that deposit in the Alzheimer's Disease brain, it is not surprising that individuals with Down syndrome are highly susceptible to Alzheimer's Disease. Research has shown that all adults with Down syndrome over the age of thirty have brain amyloid deposits, and most develop the clinical manifestations of Alzheimer's Disease in their forties or fifties, (Reisberg, 1983).

3.3.2 IS ALUMINIUM A RISK FACTOR FOR ALZHEIMER'S DISEASE?

Aluminium has been found to be associated with the changes in brain tissue that occur in Alzheimer's Disease. This has lead to the suggestion that aluminium may in some way facilitate the development of Alzheimer's Disease, but this notion has not yet been proven. Epidemiological studies have not yielded any clear evidence linking environmental exposure to aluminium with the disease. In healthy people, the "blood-brain barrier" almost completely prevents aluminium from accumulating in the brain. In fact some researchers believe that Alzheimer's Disease involves a defect in the blood-brain barrier.

3.4 OTHER MEDICAL CONDITIONS

Asthma, chronic pulmonary disease and skin lesions have been reported to occur in aluminum factory workers. Fluorosis has occurred in workers in the aluminium production industry. The lung has been the most common site identified for excess cancer in populations of aluminium production workers. In a study carried out by Wergeland et al. (1987), they found increased rates of asthma in workers in aluminium factories, but some authors attribute the cause of asthma and bronchitis in such workers to high concentrations of mixed dusts. There are reports of reduced lung function proportionate to workers' exposure to mixed dusts including aluminium. Nine workers in an abrasives plant with "prolonged heavy" exposure to aluminium oxide dust were found to have pulmonary fibrosis. The cause was determined to most likely be exposure to aluminium oxide, but possibly exposure to mixed dusts (Wergeland, 1987). For a few years there were reports of lung fibrosis having occurred in workers who produced fine aluminum powder in the pyrotechnics industry. The cause of those diseases is now attributed to the mineral oil coating which was applied to the aluminum particles in England between 1948 and 1955, (Mitchell, 1961). In those cases which did not involve coated aluminum particles, the cause of the fibrosis has been attributed to the workers' exposure to silica, rather than to their exposure to aluminum, (Mitchell, 1961). Overall, there was a borderline excess in relative risk, with some studies showing a doubling of risk and some showing no excess. In one study in which populations in the industry were compared on the basis of their exposures to pitch volatiles, there was a relationship between incidence of lung cancer and length of exposure, and a significant excess of cancer among workers who had worked for 21 years or more. In three studies In the same aluminium-producing area, an increased risk of bladder cancer was associated with work in aluminium production in plants where primarily the Söderberg process was used. Statistically significant excess risks of pancreatic cancer and leukaemia were noted as isolated findings in two studies and in one study, respectively. A survey of the aircraft industry found that numbers of cancer and nervous system diseases were lower than expected. In addition, a 1988 review of the literature concluded that, except perhaps in cases of extremely high exposure, aluminum is not carcinogenic, (Léonard, 1988). However, lung fibrosis in one Belgian metal polisher was attributed to the worker's heavy aluminium dust exposure, (DeCarlo, 1991).

3.5 THE USE OF ALUMINIUM IN THE FIELD OF SCENES OF CRIME

Aluminium powders can be used in wide ranges of application. Aluminium flakes for the production of aerated light weight concrete are getting more and more important all over the world. Manufacturers of civil explosives and the pyrotechnical industry make use of the high oxygen affinity level of aluminium for, among others, the production of slurries (safety explosives), fireworks and sparklers. The reduction potential of aluminium is used for various chemical processes in the chemical industry. Schlenk aluminium powders and pastes are, for example, used in the production of titanium oxide (white pigment for inks and paints, for paper manufacturing etc.) and aluminium phosphite. Aluminium powder is also used by the police as a fingerprinting powder. Traditionally the most used and productive method of recovering fingerprints is the application of fingerprint powder, followed by photography. The introduction of chemical and other specialist methods of recovering fingerprints are excellent in their own right but are only of use in a small percentage of cases. Of the powders available to Scenes of Crime officers, aluminium is the most used by far, (personal observation).

3.5.1 FINGERPRINTING POWDERS

Fingerprint powders can be divided into two groups: flake, and granular. Metallic flake fingerprint powders were introduced in 1970 after they had been demonstrated to members of the judiciary who formed the opinion that it was an acceptable method of recovering and recording fingerprints. Granular fingerprint powders date back to the turn of the twentieth century. The most sensitive metallic flake powders are aluminium, bronze and gold. The sensitivity level is due to the flattened shape of the flake particle. This enables the flake to present the maximum area of contact to the surface being examined. Bronze powder manufacture dates from the eighteenth and nineteenth centuries, while aluminium flake powder is essentially a twentieth century product. The industrial importance of these materials has greatly increased, especially during the last fifty years. Bronze powder is mainly a pigment, particularly for printing inks, metallized papers and other sheet materials. Aluminium flake powder, apart from its pigment applications, is largely used in a great variety of fields. notably in the manufacture of explosives and pyrotechnics and in the production of lightweight concrete.

3.5.2 HOW DOES ALUMINIUM ENTER THE BODY?

Aluminium can enter the body via food and drink, or by inhalation of dust. Despite a constant presence of aluminium in our environment, very little enters the body. Scarcely any is absorbed through the skin. The lungs are subjected to the greatest load from inhalation of dust particles, which always contain silicon and may also contain aluminium. These particles, if they remain in the body, settle inertly in the lungs where they may be enclosed with surrounding fibrous tissue, which reacts to the silica as well as to the aluminium. If inhalation of aluminium is excessive, as in the alumina powder works of many years ago, the lung fibrosis may be a prominent feature. Some cases have arisen in factories with symptoms and signs of lung disease from pulmonary fibrosis. There are no cases in modern factories and none from the inhalation of aluminium during normal life.

3.5.3 THE TOXIC EFFECT OF ALUMINIUM

The toxic effects of an excess of aluminium in the human body and in experimental animals are now well known. Aluminium toxicity causes damage to the skeletal system (the bones), the blood system, and the nervous system (chiefly the brain).

3.5.4 SHOULD WE AVOID ALUMINUM?

This is the most important question upon which this project focuses. Aluminium toxicity as an industrial disease is exceptionally rare. In all the years of aluminium production there have only been a few cases of aluminium toxicity. Hughes (1992), claims that aluminium toxicity does not arise from oral intake and that normal healthy adults can take any type of water, beverage, food, or prescribed drugs without fear of aluminium toxicity. There is no need to avoid aluminium cookware, wrapping materials, which contribute little to what one consumes, which, in any case, is harmless by mouth. The inhalation of aluminium powder is undesirable, (Hughes, 1992). Hughes (1992), goes on to say that the only authentic British case of industrial aluminium neurotoxicity arose from the inhalation of aluminium powder in an old fashioned powder factory, some forty years ago. Otherwise, there are virtually no cases of aluminium neurotoxicity as an industrial disease. Hughes (1992), also points out that inhaling aluminium powder can cause fibrosis of the lungs but this industrial hazard is easily prevented. From all the research involved in this project none suggests that aluminium causes cancer. It is the other chemicals in association at the time, and in conjunction with aluminium that are the likely cause. Aluminium by injection has been proven to be toxic, although there are scarcely any circumstances where aluminium would be given by injection. It should be borne in mind that all metals are toxic and even air and water can be lethal if injected.

3.5.5 PROTECTION

With regard to the potential harm that can be caused by inhalation of aluminium, it is clear that protective measures must be put into practice. Many Scenes of Crime Officers, in fact most, do not wear a protective dust mask when using aluminium fingerprinting powder, (personal observation). This is clearly up to the individual, but given the evidence researched in this project, it should be suggested that a mask be used.

4. CONCLUSION

Aluminium is normally present in the human body,

especially in the lungs, bones, and brain having no known function. Aluminium enters the body in our food and drink, and some is inhaled in particles of dust. There is an effective mechanism in the body to limit absorption and the kidneys control excretion, so that a healthy adult will have a balance of aluminium. During our lives, we may accumulate more aluminium in our bodies due to the gradual imperfection of the normal process of absorption and excretion of the metal. The effects of aluminium toxicity are well known from experimental studies and from case histories such as cases caused by renal dialysis several years ago, and are seen in the bone, blood, and brain. The toxicity of aluminium in medicine is exceedingly rare in medical practice. Aluminium has been suggested as a possible cause of or risk factor in Alzheimer's Disease due to its presence in the brains of Alzheimer's Disease patients (specifically beta-amyloid plaques and neurofibrillary tangles). The proposed link between dietary aluminium intake and Alzheimer's Disease is still the subject of considerable debate. No causal relationship has been established, and accumulation of aluminium in the brain may be a natural part of the disease process. Recent studies have reported the identification of various genes associated with the disease, suggesting that sufferers may have a genetic predisposition to the condition. The results of this project suggest that there is no need for any healthy adult to alter their lifestyle in any way on account of aluminium. There is no convincing scientific evidence for a causal link between aluminium and mental illness. To use the words of Hughes (1992), it is most improbable that aluminium plays any part in the causation of Alzheimer's Disease. However, it should be stressed that Hughes (1992) also warns us that inhaling aluminium powder can cause fibrosis of the lungs. As a means to prevent this a suitable dust mask should be worn by Scenes of Crime Officers when fingerprinting using aluminium powder to limit exposure. The full effect of exposure to aluminium in its different forms is still debatable among experts. Some evidence is conflicting. However, it is recognized that a lack of evidence does not mean that a relationship between aluminium and ill health does not exist. It only means that medical science cannot yet answer these questions, Clearly, further research is needed in order to resolve the significant uncertainties about aluminium and to answer the important concerns of workers.

5. REFERENCES

DeCarlo, N., Dias, J. and Gray, s., (1991) 0n behalf of Canadian Auto Workers [comments about "Propsoal: A Study of Aircraft Workers Exposed to Aluminum"] letter dated Septermber 23.

Derek, J. (1992) Aluminium in Biology and Medicine. Wiley, Sussex.

Gidley, I. and Shears, R, (1989) Aluminium -What Is It and How Do We Cope? Unwin, London,

Hughes, J. (1992) Aluminium and Your Health. Rimes House, Oxford.

Léonard, A., Gerber, G.B. Mutagenicity, carcinogenicity and teratogenicity of aluminium. Mutation Research. 1988; 196: 247-257.

Reisberg, B. (1983) Alzheimer's Disease. The Free Press, Nevi York.

Wergeland, E., Lund, E., Waage, J.E. Respiratory dysfunction after potroom asthma. American Journal of Industrial Medicine. 1987; 11: 627-636.

BIBLIOGRAPHY

Kent, T. (Editor) (1993) Fingerprint Development Handbook (abridged from the Manual of Fingerprint Development Techniques 2nd Edition). Heanor Gate, Heanor.

Fairweather-Tait, S., Hickson, K., McGaw, B. and Reid, M. Orange Juice Enhances Aluminium Absorption fro Antacid Preparation. European Journal of Clinical Nutrition. 1994; 48: 71-73.

Frazer, M. (1997) Dementia: Its Nature and Management. Churchill Livingstone, New York.

Forsythe, F. (1990) Alzheimer's Disease -The Long Bereavement.

Good, P. Uptake of Aluminium into CNS Lung nasal-olfactory Pathway. The Lancet. 1987 May 2; 1028.

Heston, L., and White, J. (1991) The Vanishing Mind -A Practical Guide. Freeman and Co., USA.

Jaques, A. (1998) Understanding Dementia. Churchill Livingstone, New York.

Jorm, A. (1990) The Epidemiology of Alzheimer's Disease and Relative disorders. Chapman and Hall, London.

Karl Goran Ljunggren, Vitauts Lidums, Bnegt Sjogren. Blood and Urine Concentrations of Aluminium Among Workers Exposed to Aluminium Flake Powders. British Journal of Industrial Medicine. 1991; 48: 106-109.

Katzman, R. (Editor) (1993) Biological Aspects of Alzheimer's Disease. Cold Spring Harbour Lab., USA.

Massey, R., Taylor, D. Aluminium in food and the Environment Royal Society of Chemistry, Spec. Publication 1989; 73: 14-16.

Mayor, G., Keiser; J., Aluminium Absorption and Distribution: Effect of Parathyroid Hormone. Science. 1977; 197: 1187-1189

McLaughin, A., Kazantzis, G., King, E., Teare, D., Porter, R. and Owen, R. Pulmonary Fibrosis and Encelphalopathy Associated in the Inhalation of Aluminium Dust. British Journal of Industrial Medicine. 1962; 19: 253-263.

Reisberg, B. (1981) A Guide to Alzheimer's Disease for Families, Spouses. and Friends. The Free Press, New York.

Reisberg, B. (1981) Brain Failure: An Introduction to Current Concepts of Senility. The Free Press, New York.

Roberts, G. Alzheimer's Disease May Begin In The Nose and May Be Caused By Aluminosilicates. Neurobiology, Aging 7; 561-567.

Selkoe D. Deciphering Aluminium Disease: The Amyloid Precursor Protein Yields New Clues. Science. 1990; 248: 1058-1060.

Sherwood, L. (1993) Human Physiology: from cells to systems. 2nd Edition. West Publishing Company, New York.

Themault, G., Cordier, S., Tremblay, C., Gingras, S. Bladder Cancer in the Aluminium Industry. The Lancet. 1984. April 28; 947-950

MINUTES OF MEETING

DATE: Saturday, August 17, 2002
LOCATION: Island Palms Hotel & Marina, San Diego
HOST: Ed Palma and Tom Washington
SECRETARY: Dennis Uyeda
SPEAKER: Paul Redden, Polygraph Examiner
San Diego Police Department
PROGRAM: Polygraph Usage in Law Enforcement

Call to Order: 2150 hours by President Steve Tillmann

ATTENDANCE:
Past Presidents: Alan McRoberts (1991), Jim Lawson (1995), Bill Leo (1996), Clint Fullen (1998), Art Coleman (2000), Robert Goss (2001).

Executive Board: Bob Goss, Steve Tillmann, George Durgin, Ed Palma, Dennis Uyeda, Gina Russel-Durgin, Tom Washington, Jim Lawson, Bill Leo, Clint Fullen, and Alan McRoberts.

Members and guests present - 94.

GIFTS: Provided by many. (Thank you)

OLD BUSINESS:

Second Reading:
Active:
Lomita Armendariz
Associate:
Po Wong
Motion to Accept: Jim Lawson
Second: Ann Fair

Swear-Ins: by Past President Bob Goss
Active:
Danny Aguilar, Los Angeles Coroner's Office
Ronald Armenta, Madera Sheriff's Dept.
Heather Heider, Santa Police Dept.
Associate:
Kelly Buchwald, Debbie Camacho, Melanie Camacho, Sharon Grimm, Stacy Poetz, Denise Vargas, and Heathe Wigington

NEW BUSINESS:

First Readings for **Active** Membership:
Brenda Bass, San Diego Sheriff's Office
Recommended by Diane Do
Irma Hernandez, INS
Recommended by Sam Bove
Katie Lassiter, INS
Recommended by Sam Bove
Nicole Mobley, INS
Recommended by Lisa DiMeo
Kathleen Rosario, San Diego District Attorney
Recommended by Ann Fair

First Readings for **Associate** Membership:
Angela DiBartola, recommended by Mary Lou DiBartola
Rebecca Limon and Laura Scott, recommended by Ed Palma
Proposed change in the bylaws.

ANNOUNCEMENTS:
Next meeting - SCAFO Training Seminar, October 11-12, 2002
Nominations: Officers -- contact Clark Fogg, Beverly Hills PD
November lunch meeting in Santa Barbara is postponed, date TBA

Attendance Drawing: Not won by Melissa Gollatz, Cathy Ringstad or Jim Lopez

Door Prizes: Won by many in attendance.

Motion to Adjourn: Art Coleman, Second: Bob Goss

Meeting Adjourned: 2240 hours

Proposed Bylaws Change

ARTICLE 2

ASSOCIATE MEMBERS

Associate Members are those non-tax paid professional men and women engaged in business similar to, or supplying equipment for, scientific criminal investigation and identification. College students whose study relates to the forensic sciences, including volunteers to a law enforcement agency whose duties relate to the forensic science or criminal justice and volunteers in a law enforcement agency whose duties relate to forensic science, are also eligible for associate membership. **Proof of current enrollment as a student taking 12 or more semester units or the applicant's volunteer status must be presented at time of application and at annual renewal.** Upon admission to membership they shall enjoy all rights and privileges of active members except voting and holding office. **Applicants for associate membership shall be screened and approved by the membership committee, to include having their names published in the official newsletter so that all members are aware of the names of the proposed associate members. Associate membership status shall be indicated on the associate member's name badge.**

ARTICLE 7

APPLICATION FOR **ACTIVE** MEMBERSHIP

Applicants for **active** membership shall be proposed and vouched for by a member in good standing. The application shall be referred to the membership committee and, if approved, the applicant shall be accepted or rejected by a majority vote of the members present at a regular meeting of the Association. The applicant will be introduced to the membership at the time of his/her first reading and the Editor will publish this information in the next issue of the newsletter so that all members will be aware of the name of the proposed member. The applicant must be present for his second reading, at which time the applicant will be voted upon. If there is a lapse of one (1) year after a prospective member's first or second reading, the prospective member must reapply for membership. The new member will be sworn in at the third meeting. The oath of membership shall be administered by the presiding officer or by a Past-President or other active member designated by the presiding officer.

*[**Underlined and bolded areas** of text are the proposed changes to existing bylaws. This proposal was announced at the August meeting. It will be voted on during the business meeting on Saturday, October 12, 2002.]*

Presidents Message

I would like to thank all of the members for a great turn out at the August meeting in San Diego. A special thanks to Ed Palma and Tom Washington for finding an informative and interesting speaker, Paul Redden (Polygraph Expert from the San Diego Police Department). Also, thanks for finding such a great location at the Island Palms Hotel and Marina on Shelter Island.

Nominations for the 2003 Board are open to all Active members in the Association. If you have ever considered running for a position on the board or if you would like to nominate a member, please contact Past President Clark Fogg (Nominations Chairman) at Beverly Hills Police Dept. (310) 285-2116, or email him at cfogg@ci.beverly-hills.ca.us. We will have two (2) openings for Directors and one (1) opening for Sergeant at Arms. Other positions may also become available. Current Directors and Board members should also contact Clark to let him know of your intentions to continue through the Chairs or as a Director for 2003. If you have any questions about what is required or expected of the positions, please feel free to contact Clark or me. This is a great opportunity to get involved with the inner workings of the Association, to make a difference, and to better the Association. Elections will take place at the luncheon meeting on Saturday, October 12th at the 11th Annual Training Seminar.

The planning for this year's seminar is coming together nicely. By now, all members should have received a flier and registration form. I think we are on the way to having one of the best seminars to date with some top experts in the field including Professor of Law, Andre Moenssens, Pat Wertheim, Dr. Laura Fulginetti, Stephen Meagher, and Alice Maceo. We are still working on a few other speakers as well. The title for the seminar is "The Scientific Foundation of Friction Ridge Identification and Confronting Courtroom Challenges". The Embassy Suites location can hold more attendees and I would like to see a packed house. Registrations have already been coming in steadily, and I would expect that we will not have many empty seats, so register as soon as possible.

Steve Tillmann

"Every man owes a part of his time and money to the business or industry in which he is engaged. No man has a moral right to withhold his support from an organization that is striving to improve conditions within his sphere."

- President Theodore Roosevelt, 1908

For subscription or membership information, or address corrections contact:

S.C.A.F.O. **Dennis Uyeda, Secretary**
P.O. Box 1594
Fair Oaks, CA 95628
(916) 227-3314
$20.00 yearly subscription (attendance required for membership)
$30.00 yearly for International Subscriptions

C.S.D.I.A.I. **Ricardo Tomboc, Treasurer**
710 North "D" Street
San Bernardino, CA 92401
(909) 384-5701
$25.00 yearly membership

I.A.I. **Joe Polski, Chief Operations Officer**
2535 Pilot Knob Road, Suite 117
Mendota Heights, MN 55120-1120
(651) 681-8566 iaisecty@theiai.org
$60.00 yearly membership

S.C.A.F.O.
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-- Upcoming Events/Schools/Seminars--

October 11-12, 2002	***S.C.A.F.O. Seminar*** **Cal-Poly Pomona**
October 26, 2002	C.S.D.I.A.I. Mid-year Business Mtg. Harris Ranch, Coalinga, CA
December 7, 2002	***S.C.A.F.O. Meeting*** George Durgin Orange County Sheriff's Department
January 6-10, 2003	Laser Fingerprint Development Workshop Center for Forensic Studies Texas Tech University
February 1, 2003	***S.C.A.F.O. Meeting*** Elaine Sena-Brown Santa Monica Police Department
February 17-22, 2003	AAFS Annual Meeting Chicago, IL
May 4-8, 2003	C.S.D.I.A.I. 87th Annual Training Seminar Palm Sprints, CA Marvin Spreyne
July 6-11, 2003	International Association for Identification Ottawa, ON, Canada

Southern California Association of Fingerprint Officers
An Association for Scientific Investigation and Identification Since 1937