MATERIALS NEWS

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COMPILED BY PRODUCT RELIABILITY INFORMATION AS A SUPPLEMENT TO **COMPONENT NEWS**

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No. 8 October 14, 1969

QUESTIONNAIRE RESULTS

Response: 17% of 440 people on the mailing list
61% favorable
29% neutral to favorable
10% unfavorable

Our thanks to all the people who took time to reply and to Charlie Chartrey for tabulating the results. We felt that the dialogue this promoted was well worthwhile. The sense of humor (What do you like most? "the red printing") helped to ease the pain of the unfavorable comments. Our critics are particularly appreciated for their candid comments which stung us into a much better realization of our shortcomings.

The comments most often heard were: "glad it's around — the communication is helpful", "helps me to know what is going on around *TEK*". We will do our best to respond to the many helpful suggestions we received, which should guide this newsletter toward being a more useful piece of information.

Some of the most often mentioned suggestions were:
Make it more brief — condense the articles to the bare essence. People interested in more detail should contact the authors.
Need much more 'user' oriented articles, such as: What is the best use for a new material, how does the material stand up under *TEK's* environmental specs on instruments, etc.
Format needs improvement for ease of reading. Beware of printing trivia just to fill up space. Cut out the long editorials! (Will try by stopping this editorial right now!)

Thanks again!

-Editorial Board

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MATERIALS NEWS HELPER TRANSFERS

Dale Grimes has moved to the Plastics Department in Building 19 and finds his new duties too time-consuming for further work on Materials News. We have appreciated his constructive participation and look forward to receiving future articles from Dale.

THE NICKEL SITUATION

Just in case you haven't heard, there is an acute shortage of nickel in the country and if present trends continue, the situation will get worse before it gets better, if it ever will at that. Many factors have contributed to the present situation. In the first place, nickel is not one of the abundant elements of the earths' crust so it has always been in short supply. The war in Vietnam has increased pressure on the already scanty supply. This, in turn, has kept the price of nickel on a continued upward spiral, a situation which is aggravated by the government's stockpiling of nickel, industry strikes, and the fact that all nickel used in the country today is imported!!!

That the days of the metal nickel were numbered has been known in the metal-working industries for many years and efforts have been and are being made to find a substitute metal. So far the monumental efforts have proved futile but they have not been abandoned. Meanwhile to cope with the immediate situation, manufacturers, designers and consumers are well advised to explore other alternatives of which the following are just a few.

First of all forget trying to find a substitute metal that will behave like nickel in all or most respects. However if you are presently manufacturing any components out of any type 300 stainless steel, or any Inconel, nickel beryllium, Monel, Kovar, Sealmet, Cupro-nickel, any of the Hastelloys, nickel-silvers, Nichrome, Chromel; or if you use nickel plating as a decorative or corrosion-protective coating, you should be advised to study your requirements and see if you could do with other non-nickel bearing metal.

For instance (1) If your choice of say 305 or 316 stainless steel is based chiefly on corrosion resistance and you can afford to live with say a high magnetic permeability, then you should consider changing to a type 200 or a type 400 grade. (400 series are mostly straight chromium while in both of the 200 grades most of the nickel is replaced by manganese.) (2) Coper-beryllium as a spring material will, in many cases, adequately function in place of nickel-beryllium for the same applications. (3) Albaloy plating has similar or superior decorative and corrosion resistance as nickel and has far better solderability. The Monels, nickel-silvers and Cupro-nickels are used

chiefly because of their superior corrosion resistance in marine applications. Otherwise ordinary brass will adequately do the jobs these alloys do. If corrosion resistance beyond ordinary atmospheres is required the brass can be plated with cadmium or Albaloy or tin or chromium.

The nickel-base super alloys like the Inconels, Nimonics, Hastelloys, Waspaloy, Udimet, Rene' 41, etc. are difficult to replace. Fortunately most of these are used in defense applications.

The specialty alloys like Kovar, Invar, Sealmet and other low-expansion metals used in the glass-to-metal sealing business, are also going to be difficult to replace. In the same category are the permanent magnetic and high permeability metals. In the case of those nickel alloys used in glass-to-metal seal applications, perhaps this is the time for engineers and technicians to study alternate sealing methods which will not make it essential to match expansion co-efficients of the glass and the metal. Some permanent magnet alloys, unlike the "alnicos" or the "cunifes", do not contain nickel; their use in place of the nickel alloys should be investigated. The high permeability alloys like "mumetal", "hymu", etc. presently appear to be not replaceable. The metallurgical department will gladly consult with anybody who is faced with the problem of replacing a nickel bearing metal with nickel-free metal. If you need such assistance, please call Ext 7833 or come to 38-314 in the Electrochem building.

-K. Mensah, Ext 7833
Electrochem.
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NEODYMIUM GLASS LASER

The electron gun area has recently ordered a Nd: glass laser to be delivered before November 8, 1969. This device will be used in making repairs on reject guns and sealed CRT's. Since this may not require all available time, some time might be free for the development of engineering ideas.

Briefly, the laser we have ordered is a 0.5 to 3 millisecond pulse type device delivering up to ten joules of 1.06 micron (10,600 Å) wavelength light at up to three pulses per minute.

In general, the laser is useful wherever a precise, monochromatic, collimated, repeatable source of energy is required. It is easily focussed to a very fine point which, of course, yields extremely high temperatures at the focus. In fact, no known material can withstand the temperatures at the focus of even a medium sized laser.

One use area that we intend to explore is welding. Our own welding group has several applications in mind, including welding inaccessible points and welding difficult metals such as tungsten and molybdenum.

Another possible application might be vaporizing small quantities of matter for spectroscopic study, either by conventional or Raman techniques. This is, of course, outside our area, but might hold interest for other groups.

Some chemists have used the laser to bring about reactions in a very localized area. These may be processes requiring either extreme heat or energy corresponding to 1.06 microns.

For information about availability and capabilities of the system, please feel free to call me.

-Denton Bramwell, Ext 6310
CRT Production Engineering
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ELECTRO-PLATING BLACK CHROME

A black chromium finish was introduced to industry in the mid 60's and to *TEKTRONIX* in 1967. It is an interesting finish in that it is applied electrolytically, the same as bright chrome, but the deposit is a mixture of chromium compounds including hydrides and nitrides. Surprisingly too, many physical characteristics of the deposit are about the same as far conventional bright chromium. The texture reproduces the surface on which it is deposited, all the way from a shiny black to a dull matte finish. Pertinent information on properties includes:

1. Thickness; approximately same as bright chrome, 5-15 micro-inches.
2. Corrosion resistance; approximately same as bright chrome after ten-day humidity or 50-hour salt spray.
3. Abrasion resistance; slightly better than for bright chrome, as determined by sand-flow tests (however it should be recognized that a scratch through the black chrome is generally more visible because of the different color of the underlying metal).
4. Electrical contact resistance; same as bright chrome.

Currently black chrome is being used as a dull finish on camera shutter parts (steel and brass), crank handle and knob for the tape drive on the 491 ("nickel-silver" powder metallurgy substrate), and on all mesh-filter screen material (stainless steel). The Ceramics Plant finds it is a superior coating for stainless steel trays used at temperatures up to 1500°F. Cost of application is about the same as for bright or satin chrome. Electrochem's facilities are capable of handling material up to about ten square feet total area, with maximum dimensions of two by three feet. Unfortunately it cannot be barrel-plated, which virtually precludes its use for large-volume production of small parts such as screws or bolts, unless cost of racking parts individually can be justified.

Summary: Black chrome is about like bright chrom or satin chrome in every possible respect except it is black.

-Jerry Jacky, Ext 7817
-Doug MacDonald, Ext 6584
Electrochem.
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