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USE OF LEAD CHEMICALS WITH VINYL PLASTICS*

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The use of lead in the form of lead chemicals for the stabilization of vinyl chloride resins is now about ten years old. As you may know, unless these so-called stabilizers are incorporated into polyvinyl chloride plastics, commonly known as "vinyls," the products made from these resins will deteriorate very quickly under normal use conditions involving heat and light, and indeed could not even be manufactured, if it were not for so called "stabilizers." Also during the manufacture of vinyl plastics much heat is encountered in the milling, calendering, and extruding processes. Such heat is necessary in order to melt or fuse the resin into a continuous, homogeneous material. At these elevated temperatures which reach about 375° F, a small amount of hydrochloric acid is released from the vinyl resin which, if not neutralized, will rapidly degrade the plastic. Lead compounds were among the earliest materials tested to react with this free acid to form basic lead chloride, which is not harmful to the finished product.

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These lead compounds, in small percentages of the finished plastic material were found to be very effective for this purpose, and indeed continue to be the most widely used today, because of their general all-around effectiveness.

Originally, some 20 years ago basic carbonate of lead, litharge, and later basic silicate of lead were widely used and still are. However, today, other lead compounds, especially designed and controlled for such purposes have been shown to be superior for specific uses. As more of the chemistry of vinyl resin stabilization was learned, new compounds of lead were developed. Several hundred such salts were prepared and tested, and as you might expect a few possessed better characteristics than others. Such compounds include tribasic lead sulfate, lead phosphites, lead stearates, lead phthalates, lead salicylates, and others, each of which was designed to satisfy a definite need. For example, tribasic lead sulphate is an excellent heat stabilizer, and is used where this property is most important, such as insulated wire stocks and other extruded compounds. Materials like the lead salts of phthalic and phosphorous acids have a very high degree of both light stability and heat stability, and they can do both jobs very effectively. Lead salicylate being an anti-oxident is a specific ultraviolet light screening agent amongst other things, and is used in products like vinyl floor tile where its effectiveness with asbestos filler is most important. Lead stearates are known as stabilizer-lubricants and are used in phonograph records, where both stability and lubricity are very important, and high fidelity and mold release are oftentimes the criteria. Other lead compounds having a refractive index of light nearly that of the vinyl resin itself are used in translucent and brightly colored film and sheeting stocks. In other words, nearly all of the lead stabilizers are tailor-made to do a specific job.

It is estimated that the current use of lead for the manufacture of vinyl stabilizers is in the neighborhood of 4,000 tons per year. This amount will probably grow as the vinyl industry grows and is currently growing at the rate of nearly 20% per year. The best informed sources estimate 600,000,000 pounds of vinyl resin per year by 1956. Present production is about 4,000,000 pounds per year. Although this 4,000 tons of lead is a small amount in comparison with the total lead consumption in the country, it represents an important use, because it finds its way into perhaps six or seven hundred million pounds of finished products where lead has not been found before. Such products include shower curtains, rain coats, upholstery, draperies, table cloths, phonograph records, garden hose, insulated wire, footwear, and many smaller outlets.

Of course there are many other metallic compounds used as stabilizers for vinyls whose characteristics are such that they fill a need which lead salts cannot do, as we shall see later. Salts of tin, barium, cadmium, sodium, strontium, are used to a lesser and varying extent.

In the last year particularly new compounds of cadmium and barium together with epoxy compounds have made some inroads for specific uses into the field of vinyl stabilizers. As in any industry, especially the chemical industry, which is everchanging through research and development, better performing new materials will replace older ones when they are shown to do a better job. Furthermore, being such a small percentage of just one plastic material, vinyl stabilizers are at the mercy of whatever new plastic materials may be developed which may not need stabilizers at all. However, lead chemicals will continue to be the most widely used of all stabilizer compounds for the vinyl field for some time to come.

We have spent considerable time, as has this association, educating people in the plastics industry in handling lead and overcoming certain prejudices concerning the toxicity of lead compounds. Of course, we all know this whole story, but it is amazing to discover what prejudices against lead do exist and how silly some specifications are. The Lead Industries Association are rendering a great service to the lead industry by sending educational information to manufacturers of plastic products to overcome these prejudices. For example, the fact that lead compounds are included in some end-products, creates resistance in the minds of many large buyers of plastics, yet they are perfectly willing to buy materials containing other metal compounds which we know are in some instances more toxic than lead.

We at National Lead do a great deal of technical service work, which is very necessary when serving such an industry, and try to keep ahead or at least abreast of the trends in the whole plastics field so we can produce those materials which are needed and desired. While this, together with research and development, is costly, it is necessary in the fast-moving chemical industry and, so far, we have found it to be worthwhile.

We have been well pleased with the progress of the vinyl plastic industry and particularly our part in it to date, and we are looking forward to substantial increases in the lead requirements in this field during the next several years.