A stringent goal on lead in urban air

Past experience wtih William D. Ruckelshaus, Environmental Protection Agency boss, reassures reporters that he knows what he is doing (although he doesn't always tell them what it is). Otherwise, events such as this week's press conference on EPA's plans for reducing lead in gasoline would leave the media men wondering.

What Ruckelshaus and his top staffers must surely be doing is laying the groundwork for a concerted attack on the automobile in urban areas. Their technique, possibly the only one open to them, is to go ahead with plans for emission controls as prescribed under the 1970 Clean Air Amendments. As these plans develop, the impossibility of realizing them will become so clear to everyone (the thinking may go) that the alternative of urban mass transit will be seen as the only possible option left open.

This week's proposal is for a maximum of two micrograms of lead per cubic meter in ambient air, averaged over three months, a level that is exceeded in cities from Fairbanks, Alaska, to Richmond, Va. (with rush-hour levels as high as 54 micrograms along the Los Angeles freeway). The means of reaching the goal is to have lead-free 91-octane gas available after July 1, 1974, and to step down the lead content of other gasolines (required for older cars with higher octane requirements) to a maximum of 1.25 grams per gallon after Jan. 1, 1977.

Two considerations are involved: 1) The need for lead-free gasoline to prevent ruining catalytic mufflers on cars meeting 1975 emission standards, and 2) public health. There is evidence that even a tankful of leaded gasoline would poison the catalysts in the mufflers. To prevent this, EPA is calling for automobile filler spouts and service station nozzles that fit together, or fail to fit together, in ways to prevent leaded gasoline from going into cars with catalytic mufflers. If this sounds Rube Goldbergish, a far greater problem comes in determining whether any given car has a poisoned catalytic muffler. (A gasoline delivery truck putting leaded gasoline in the wrong tank could possibly ruin a lot of them.) If the car had just been given an annual inspection, for instance, the failure of the muffler would not be detected for another year. But, as Eric Stork, EPA's vehicle air pollution chief, admitted, this doesn't matter much now anyway; presently there is no feasible testing device local or state testing agencies could use for the 1975 emission standards.

The lead-removal stakes are high as far as public health is concerned. Lead taken into the bodies of urban residents from food and air is already high, although not demonstrably toxic for a mythical average citizen. For an unmythical ghetto child, the scales can be tipped in favor of toxicity with painful ease. For instance, much of the lead from exhausts goes into roadside dust. "It has been calculated," says an EPA background paper, "that daily ingestion by a one-year-old child of as little as 1/24th of a teaspoon of dust from within 100 feet of a busy roadway would, within eight months, result in lead poisoning." Anemia is a prime toxic effect of lead. With many ghetto children already suffering from iron deficiencies and hemoglobin-inhibiting high carbon monoxide levels, it doesn't take much more to precipitate serious illness. □

Predicting when a metal becomes superconductive

Dietrick Thomsen

Mota: Extrapolating to pure metal.

Superconductivity presents theoretical difficulties for physicists. They can make theories that tell why it should exist, but the theories cannot predict the existence of superconductivity in particular metals nor at what temperature it will appear. Many attempts have been made to use the normal nonsuperconducting properties of a metal to predict the onset of superconductivity.

The basic belief persists that all metals become either superconducting or magnetic if they are cooled to low enough temperatures. But testing this prediction as well as other specific ones is often hampered because the temperature of transition may be below the lowest temperature obtainable in laboratory devices, two millidegrees K.

At the American Physical Society meeting in San Francisco two experimental methods of overcoming this difficulty were presented. One, by A. C. Mota of the University of California at San Diego uses alloys to extrapolate the properties of a pure metal. The other, by John Clarke, Stuart Freake and Michael L. Rappaport of UC Berkeley, uses sandwiches.

The Berkeley group placed the metal they wanted to study in a sandwich with lead. At two millidegrees the lead was superconducting, and some of its superconductivity overflowed into the test metal (iridium). The extent of the overflow allowed them to predict the lower temperature at which the iridium would be superconducting.

Mota's technique is to use an alloy of the test metal that is superconducting at attainable temperatures. Gradually she decreases the proportion of the alloying metal and makes a graph of the temperatures at which superconductivity sets in as the alloy becomes purer. She then extrapolates to find a transition temperature for the pure test metal.

Using a magnesium-cadmium alloy, Mota predicts a transition temperature of half a millidegree for pure magnesium. For rhodium she gets 0.2 millidegrees. The magnesium figure, she says, is in reasonable agreement with phenomenological predictions based on the nonsuperconducting properties of magnesium, the first time that such a prediction has been so closely supported by experiment. In the future she intends to study copper, silver and gold, "which is something nobody knows about." □

Recent discoveries at Lake Rudolf

For four years Richard E. Leakey has been excavating on the eastern shore of Lake Rudolf in Northern Kenya. His goal has been to establish, one way or the other, the relationship between the genus *Australopithecus* (discovered in 1924 in South Africa) and the genus *Homo*. It was first postulated that *Australopithecus africanus* was ancestral to *Homo*. *Homo* would have broken off from this line about one million years ago and developed into modern man. This interpretation, however, was based on sparse geological evidence and poor contextual data. Exact dating was impossible.

In East Africa the situation is different—especially around Lake Rudolf. Sedimentary levels, as deep as 2,000 feet, date back to at least 5 million years. Exposure of the various levels makes geological data and potassium-argon dating highly reliable. With such a favorable situation, Leakey went to Lake Rudolf hoping to prove that *A. africanus* was a contemporary, not an ancestor of *Homo*.

After his 1970 season, he had enough evidence to say *Homo* and *Australopithecus* are "quite separate and distinct early Pleistocene hominids" (SN: 6/12/71, p. 399). The theory, at the time, was not widely accepted.