Waste ash from coal could save billions in repairing US bridges and roads

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Coating concrete destined to rebuild America's crumbling bridges and roadways with some of the millions of tons of ash left over from burning coal could extend the life of those structures by decades, saving billions of dollars of taxpayer money, scientists reported here today at the 241st National Meeting & Exposition of the American Chemical Society. They reported on a new coating material for concrete made from flyash that is hundreds of times more durable than existing coatings and costs only half as much.

Study leader Charles Carraher, Ph.D., explained that the more than 450 coal-burning electric power plants in the United States produce about 130 million tons of "flyash" each year. Before air pollution laws, those fine particles of soot and dust flew up smokestacks and into the air. Power plants now collect the ash.

"Flyash poses enormous waste disposal problems," Carraher said. "Some of it does get recycled and reused. But almost 70 percent winds up in landfills every year, where space is increasingly scarce and expensive. Our research indicates that this waste could become a valuable resource as a shield-like coating to keep concrete from deteriorating and crumbling as it ages."

Carraher, who is with Florida Atlantic University, said that the new material can be used to coat and protect from corrosion steel reinforcing bar, or "rebar," rods embedded in concrete to reinforce and strengthen it. The coating also is suitable for repairing damaged concrete. This is part

of a joint project between industry (Felix Achille, of Blue World Crete) and academia (Charles E. Carraher, Ph.D., Dept. of Chemistry and Biochemistry; Madasamy Arockiasamy, Ph.D., Dept. of Civil Engineering; and Perambur Neelakantaswamy, Ph.D., Dept. Electrical Engineering and Computer Science).

Laboratory tests have shown that the coating has excellent strength and durability when exposed to heat, cold, rain, and other simulated environmental conditions harsher than any that would occur in the real world, Carraher said. The coating protected concrete from deterioration, for instance, that involved exposure to the acids in air pollution that were 100,000 times more concentrated than typical outdoor levels environment. Coated concrete remained strong and intact for more than a year of observation, while ordinary concrete often began to crumble within days, he said.

Carraher cited U.S. Environmental Protection Agency estimates for the cost for repair, restoration, and replacement of concrete in domestic wastewater and drinking water systems. They range up to $1.3 trillion, and by some accounts must be completed by 2020 to avoid environmental and public health crisis problems. Crumbling concrete roads and bridges will require hundreds of billions more.

Use of the coating could extend the lifespan of those structures, with enormous savings, while helping to solve the flyash disposal problem, Carraher noted.

Provided by American Chemical Society