Release No. 21
Mexico City, May 10th, 2026

IPN Researchers Develop Permeable Concrete Using Recycled Construction Waste

- **Recycling construction materials reduces the exploitation of quarries, an activity that impacts ecosystems, alters natural landscapes, and generates significant pollutant emissions**

Researchers from the Escuela Superior de Ingeniería y Arquitectura (ESIA), Zacatenco Unit, at the Instituto Politécnico Nacional (IPN), developed a permeable concrete made from construction debris and recycled asphalt pavement.

This innovation could give new life to highly polluting materials while also contributing to groundwater recharge by allowing rainwater to infiltrate the subsoil in urban areas with moderate traffic conditions.

The research was led by Dr. Everth Jimena Leal Castañeda in collaboration with Civil Engineering specialist Miguel Ángel González Martínez, who sought to transform demolition waste and materials removed from roadway resurfacing into a sustainable alternative for urban infrastructure.

The ESIA Zacatenco project aligns with the policies promoted by President Claudia Sheinbaum Pardo and Secretary of Public Education Mario Delgado Carrillo.

The proposal opens the door to future improvements aimed at increasing strength and expanding its applications. Dr. Leal Castañeda believes that, with continued development, this material could become a viable alternative for sustainable urban projects, especially in cities simultaneously facing water shortages and severe waste management challenges.

The researcher noted that the construction industry in Mexico City generates an estimated 14,000 tons of waste daily, while nationwide the figure reaches approximately 12 million tons annually. This represents a substantial source of recyclable raw material that could help reduce pollution while contributing to groundwater replenishment.

More than just an innovation in construction materials, the proposal represents a new vision for cities, where construction waste ceases to be a source of contamination, becomes useful again, and helps transform every rainfall into an opportunity to return water to the earth.

Another important benefit, emphasized the Polytechnic researcher, is the reduction in the extraction of virgin materials from stone quarries. Reusing demolished concrete and asphalt pavement—classified as special handling waste—reduces the need to exploit quarries, an activity that affects ecosystems, alters natural landscapes, and generates significant pollutant emissions.

The experimental phase of the project was strengthened through an academic stay carried out by Miguel Ángel González Martínez at the Polytechnic University of Catalonia in Spain, where he received guidance from Dr. José Manuel Gómez Soberón.

The development of the material followed specific construction quality standards and included evaluations of its strength, porosity, and functionality.

The test results confirmed that the material can perform effectively in moderate-traffic urban projects while maintaining its permeability without compromising structural functionality.

For more information, visit www.ipn.mx

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