

ABSTRACT (300 word limit)**Title: New approaches to decarbonizing the US construction and cement industries**

The impact of cement production on CO₂ emissions and on global warming is enormous. Concrete is the largest material by weight and volume that humanity produces, it has a colossal carbon footprint, accounting for more than 8% of global CO₂ emissions. Moreover, once demolished, most of the concrete ends up in landfills. Construction and demolition is the most significant waste stream accounting for 3 billion tons globally¹. According to the U.S. Environmental Protection Agency (EPA), concrete and asphalt make up to 85% of all construction and demolishing waste with only 15% being recycled. A major reason for the lack of recycling concrete is its low downcycle value.

To address this complex problem, we propose an innovative approach to utilizing waste concrete, which can be used as an inexpensive adsorbent of both CO₂ and NO₂. The uniqueness of our strategy is that exposure to those two pollutants, which are both created at high temperatures of fuel combustion during cement production, will have reduce carbon footprint and potentially transform the construction practices. Due to exposure to NO₂, the waste concrete will possess new anticorrosive properties and will be classified as an anticorrosive additive rather than waste. Secondly, it will become a medium for storing CO₂ to mitigate greenhouse gases (GHG) emissions. Thirdly, this new form of waste concrete can be reused as coarse/fine aggregates in new constructions. There, however, several challenges, such as potential reduction in compressive strength of the CO₂ exposed recycled concrete. As a result, the adoption of this technology by industry is quite uncertain, as there is insufficient knowledge about this approach's economic and regulatory advantages. With reliable Life Cycle Assessment (LCA) and solid scientific underpinnings, we expect the proposed approach to face lower adoption barriers and move this innovation from lab to construction sites and cement kilns.