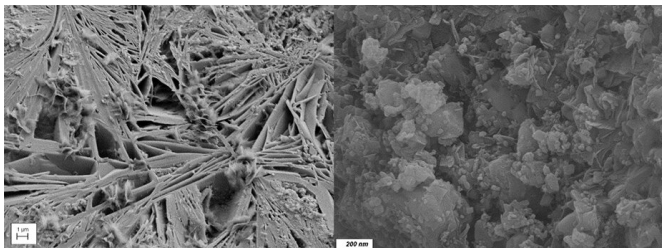
Researchers pave the way to salt-resistant concrete

26 July 2019, by Tim Pilgrim



(Left) Sodium Acetate at x10000 zoom (Right) Sodium Acetate interacting with concrete at x20000 zoom. Credit: Brunel University London

Pavements could soon be saved from some of the ravages of the winter chill thanks to a new type of low-cost concrete that absorbs significantly less of the salt that gets spread on it annually.

Every year, salt—also known as sodium chloride—gets spread in vast quantities on roads and pavements to stop them freezing. Most of this salt is ultimately washed away, but large quantities are absorbed as salty water, which causes the concrete to deteriorate and steel within to rust and corrode.

Now, researchers from Brunel University London have devised a new concrete mix that absorbs 64% less water and 90% less salt than normal concrete, whilst being up to 42% stronger. It's hoped the new mix could lead to pavements that are best placed to withstand their annual dousing of salt.

"Incorporation of a sodium acetate compound into concrete, at the mixing stage, works on absorbing some of the water to form crystals that line the walls of the pores in the concrete," said Mazen Al-Kheetan, a Ph.D. student at the Brunel's department of Civil and Environmental Engineering, who is leading the project.

"These crystals increase the hydrophobicity of the concrete—the amount concrete repels the water—which ensures the reduction of water uptake through the pores.

"Also, when applying de-icing salt to pavements made from this concrete mix, the presence of the protective compound within the pores work on fending off both the water and the waterborne chlorides."

Whilst "the long-term performance of this material is being evaluated," said Mr Al-Kheetan, the research team is confident that new mix can offer substantial economic advantages, as it's cheap and easy to prepare, unlike currently available alternatives.

They're also confident whilst the new mix offers better protection from salt damage, it doesn't do so at the expense of performance in other areas.

"In our initial experimental work, we noticed that using the sodium acetate compound might reduce the compressive strength of concrete, despite its advantage in reducing the water absorption of concrete," said Mr Al-Kheetan.

"Accordingly, we have worked on producing an optimum formulation of concrete with optimum compound dose to achieve maximum protection and preserved strength.

"Interestingly, we managed to produce concrete with the incorporated compound that has 64% less permeability than normal concrete and reduces chloride ingress by more than 90%. Meanwhile, when it came to the compressive strength of concrete, a maximum strength gain of 42% was achieved."

The research paper—Integration of Anhydrous Sodium Acetate (ASAc) into Concrete Pavement for Protection against Harmful Impact of Deicing Salt—is available now through the journal The

Journal of The Minerals, Metals & Materials Society.

More information: Mazen J. Al-Kheetan et al. Integration of Anhydrous Sodium Acetate (ASAc) into Concrete Pavement for Protection against Harmful Impact of Deicing Salt, *JOM* (2019). DOI: 10.1007/s11837-019-03624-3

Provided by Brunel University

APA citation: Researchers pave the way to salt-resistant concrete (2019, July 26) retrieved 19 October 2019 from https://techxplore.com/news/2019-07-pave-salt-resistant-concrete.html