COLD CLIMATE HOUSING RESEARCH CENTER
CCHRC

Geopolymers in Alaska

The Cold Climate Housing Research Center is performing a high level analysis of the local market potential for geopolymer cements. The analysis includes an assessment of available local materials, potential of local product manufacturing, and potential economic feasibility. This is a sister project to the Magnesium Phosphate Cement Testing and Application project funded by Alaska Housing Finance Corporation (AHFC).

About Geopolymers

CCHRC is developing geopolymer cement formulas that use local raw materials and analyzing the market potential for the product in Alaska.
Geopolymer cements use waste materials as a binder and are stronger and more sustainable than conventional Portland cements. CCHRC has studied more than 600 recipes of geopolymers made with use fly ash, a byproduct of coal combustion, from local power plants. Researchers are working to develop a product that is strong, cost-competitive and cures at the right time and temperature to be used commercially. Geopolymers are already commercially available elsewhere in the world.

Creating cement requires water, an alumina silicate material, and an alkali activator such as sodium hydroxide and sodium silicate. Nearly any product made with concrete can be made with geopolymer cements. The applications are endless for buildings, transportation, and many other areas.

They differ from Portland cements in several key ways:

- stronger and more durable
- fireproof and waterproof
- bond more strongly to most materials, including steel and aggregates
- do not appreciably expand or contract
- Are foamable
- greater resistant to salts, acids and alkalis
- Release approximately 80% less carbon dioxide into the atmosphere
- Can address both everyday and extreme challenges throughout Alaska.
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One reason Portland cement is so carbon intensive is that production requires a very high temperature during the firing process. Geopolymer, on the other hand, doesn't have to be fired. Geopolymers cure much more rapidly than Portland-based cements, with set times ranging between several minutes and a few hours. Therefore, they are not mixed at a batch plant and delivered in a redi-mix truck. Geopolymers also form a strong chemical bond with previously placed material and have relatively little expansion.
CCHRC plans to move the technology to commercial production and use, and has attracted several partners for this process.