

## NASA's synthetic soil may mean less fertilizer, pollution on Earth

Imagine a flower bed that needs fertilizer only once every few years yet has a higher annual fertility than is capable with any mix of current fertilizers. And it would have less potential to pollute, to boot.

A soil to allow such fertility may soon come from space.

NASA's Johnson Space Center in Houston is working on zeolite soil, a synthetic soil system with the capability of time-releasing nutrients, perhaps over a period of years.

The key to the substance is a group of minerals called zeolites, which are found commonly across the western states as chalky, white rock. But they have the ability to adsorb and hold plant nutrients. And they can be engineered to time-release the

nutrients, according to NASA's Doug Ming, a researcher at Johnson Space Center.

Zeolite can store nitrogen and potassium; another NASA-developed supplemental mineral called synthetic apatite can similarly store the other essential plant nutrients (phosphorus, calcium, magnesium, sulfur, iron, zinc, manganese, copper, molybdenum, boron and chlorine).

The enriched zeolite and synthetic apatite are mixed together to form the zeolite soil mix, Ming says.

Original research stemmed from a problem of how to grow plants in the lunar soil and turned into a project involving hydroponics—growing plants in a precisely controlled and circulated nutrient-rich water solution—such as was planned to be used aboard spacecraft.

"We have continuously grown wheat in a zeolite soil mix for 225 days and still had 85 to 90 percent of its total fertility left," Ming says. "With its absorption and holding characteristics, it could provide a cost-effective solution to the increasing problem of pollution from fertilizers and their runoff."

If commercial concerns can reduce the expense involved in creating the zeolite soil, the potential for widespread use is great, NASA believes. In addition to a type of zeolite soil mix as a fertilizer, just the synthetic apatite could have potential as a fertilizer, providing the secondary and trace nutrients, Ming adds.

Future research may even reduce the need for watering by combining the zeolite soil mix with already-known materials that absorb water from the atmosphere.



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