

# Carrots: Good for your eyes, and for degradable polymers

February 21 2023

---



A compound derived from  $\beta$ -carotene was one of the building blocks in a fully degradable, biobased polymer. Credit: Helen Tran

Carrots come in a rainbow of bright colors—red, orange, yellow and

purplish black—because of compounds called carotenoids. They help support eye health by reacting with potentially harmful UV light. Interestingly, the molecular structures of carotenoids, such as  $\beta$ -carotene, are similar to the building blocks of some polymers. Now, researchers reporting in the *Journal of the American Chemical Society* have incorporated a compound derived from  $\beta$ -carotene into a polymer that's fully degradable.

Polymers and plastics formed from natural, biodegradable ingredients are highly desired for use in consumer products. By using indigo, vanillin and melanin, scientists have created biobased polymers that have electrically conductive properties that are attractive for [energy storage](#), biomedical and sensor applications.

Carotenoids are another set of natural compounds expected to transfer charges, but they haven't been widely tested in [polymer](#) design. Another possible benefit is that these compounds break apart in the presence of UV light and certain chemicals. So, Azalea Uva, Angela Lin and Helen Tran wanted to use a carotenoid-sourced compound to make a degradable material that could be selectively broken down with an acid and sunlight.

The researchers combined the carotenoid derived from  $\beta$ -carotene, a 10-carbon dialdehyde, and p-phenylenediamines, a group of compounds used in degradable polymers, to make three different poly(azomethine)s. When dried, the resulting materials ranged in color from black to bright red.

In initial experiments, the team determined that the bright red version—created with p-phenylenediamine containing two hexyl side chains—was the best candidate to test further. The material completely broke down into its original components in acidic solutions, which could potentially be recovered.

However, when both acid and artificial sunlight were used, this process sped up. And after an extended period of time, the sample broke down even further into smaller dialdehydes and other compounds. The next step is to evaluate this new fully degradable polymer's ability to conduct electricity, the researchers say.

**More information:** Azalea Uva et al, Biobased, Degradable, and Conjugated Poly(Azomethine)s, *Journal of the American Chemical Society* (2023). [DOI: 10.1021/jacs.2c12668](https://doi.org/10.1021/jacs.2c12668)

Provided by American Chemical Society

Citation: Carrots: Good for your eyes, and for degradable polymers (2023, February 21) retrieved 28 June 2024 from <https://phys.org/news/2023-02-carrots-good-eyes-degradable-polymers.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.