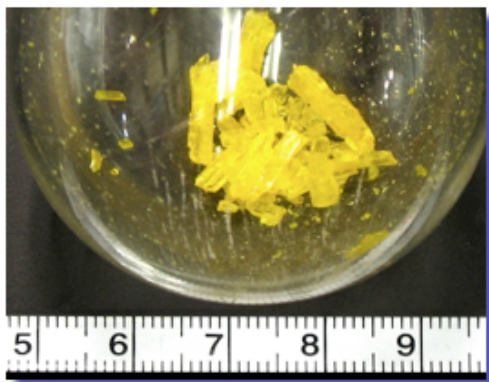


Radical Approach To Better Batteries

Using a silicon-based radical compound as an anode material produces a high-power lithium-free battery for future automotive and power grid applications



Crystals of the radical compound $(R_2R'Si)_3Si^\cdot$, where R = tert-butyl and R' = methyl, were used to make a battery anode.

Energy storage is among today's greatest technical challenges, and chemists are playing a leading role by developing new materials to improve battery technology for automotive and power grid applications. In one of the latest advances, an academia-industry team has designed a high-performance battery that uses nascent silicon and heavier group 14 radical compounds as anode materials (*Angew. Chem. Int. Ed.* **2013**, DOI: [10.1002/anie.201308302](https://doi.org/10.1002/anie.201308302)). The researchers, led by, [Akira Sekiguchi of the University of Tsukuba](#) and [Hideyuki Nakano of Toyota Central R&D Labs](#), both in Japan, have been exploring new materials for making lithium-free batteries. In the current work, they focused on crystals of the radical compounds $(R_2R'Si)_3E$, where R = tert-butyl, R' = methyl, and E = Si, Ge, or Sn. They mixed the radical compounds with carbon black to make anodes and then paired the anodes with a graphite cathode. During the charge-discharge cycle, the radicals are reduced to form anions and then oxidized to re-form radicals. The anodes have a larger energy density than standard dual graphite batteries, with the silicon radical providing the best performance. "This is a nice example of a potential application for compounds that were hardly believed to exist at ambient conditions 10 years ago," Sekiguchi says.

