

A team of researchers from Trinity College Dublin, Oxford University, the University of Bath and the ISIS neutron spallation source, have explained for the first time the fundamental reason for the high conductivity of lead dioxide, the key material that makes lead-acid batteries, which are found in most cars, function. A report of the research appears in [this week's Physical Review Letters](#).

“The lead acid battery in a car must deliver exceptionally high electrical current and the key element of this is the lead dioxide anode which stores the energy within the battery. To release this energy requires lead oxide to have a very high conductivity and while lead-acid batteries have been around for over 150 years the fundamental reason for the high conductivity has remained elusive”, said Prof. Graeme Watson of the Trinity College’s Department of Chemistry, an author of the paper.



The team used a combination of computational solid state chemistry and neutron diffraction to demonstrate that lead dioxide is in fact intrinsically an insulator with a small electronic band gap. They also showed that lead oxide very easily loses oxygen which causes it to become electron rich and transforming it from an insulator into a metallic conductor. The researcher team believes these insights could open up new avenues for the selection of improved materials for modern battery technologies.