Researchers at the Colorado School of Mines and their colleagues are developing a composite material to vastly increase the rate of proton conduction through ceramics. Nanosized metal particles, embedded within a ceramic, generate an electronic space charge layer at metal/ceramic interfaces. Based on the theory that protons move quickly through such regions, composite materials have been designed in which the space charge layers are interconnected. This results in an entirely new form of proton conductor which could be a boon to fuel cell technology.

Quantum mechanics calculations help to determine the basic nature of the proton hopping.

SEM image of sintered 10%-doped BaCeO$_3$ with 2wt% Pd nanoparticles