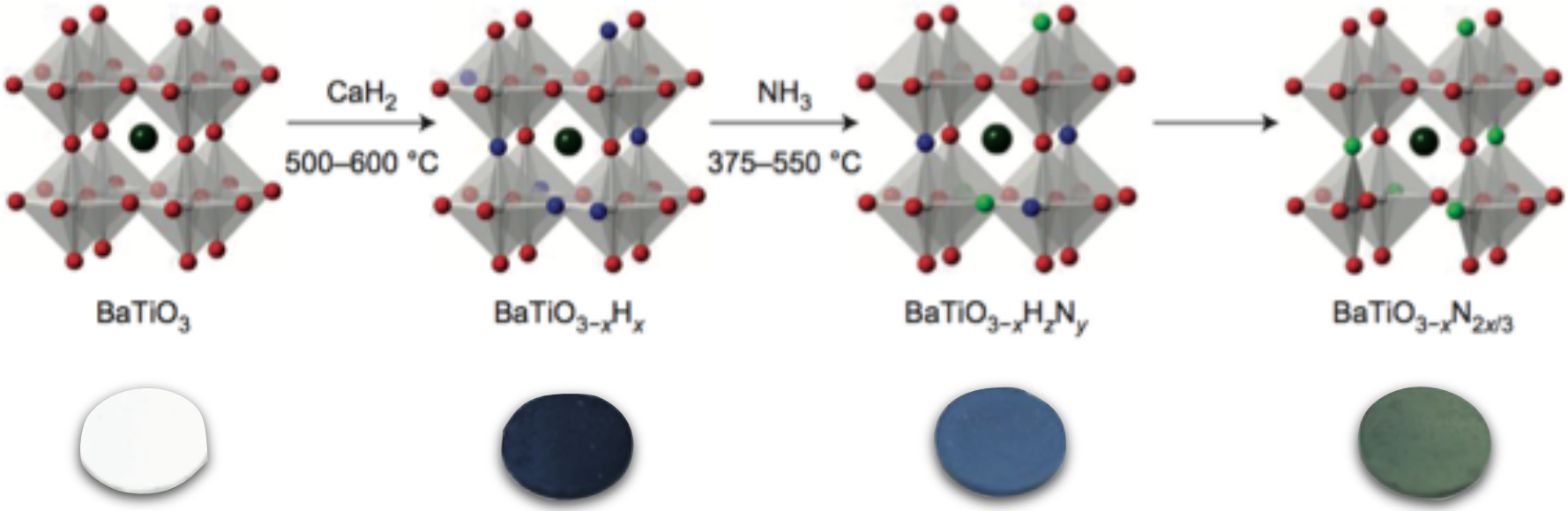
A Ferroelectric with a Metal-Insulator Transition



Oxynitrides are attractive due to a combination of visible-light absorption, photocatalytic activity, and high dielectric permittivity. Their synthesis typically requires high-temperature NH_3 treatment of oxides, but the highly reducing conditions and the low mobility of N^{3-} greatly constraint the composition, structure, and hence properties of the resulting oxynitrides.

A MRSEC team has demonstrated a **topochemical route** to making oxynitrides at less than 500°C using a perovskite oxyhydride as a host, obtaining a room-temperature ferroelectric $BaTiO_{3-x}N_{2x/3}$. Anion exchange is accompanied by a metal-to-insulator cross-over via mixed O–H–N intermediates. This “labile hydride” strategy can now be applied to other oxynitrides and perhaps other mixed anionic compounds. $BaTiO_{3-x}N_{2x/3}$ also has potential applications in next-generation electronics.

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