Delafossite oxides

Jean-Pierre Doumerc
Institut de Chimie de la Matière Condensée de Bordeaux
ICMCB-CNRS, 87, avenue du Dr. A. Schweitzer, 33608 Pessac Cedex
doumerc@icmcb-bordeaux.cnrs.fr

Delafossites have not been studied as extensively as some other oxide families such as, for instance, perovskites although it was in 1873 that Charles Friedel proposed to name the mineral $CuFeO_2$ in honor of the French crystallographer Gabriel Delafosse, but it is one century later that they really emerge with the outstanding work of the group of Dupont de Nemours. Meanwhile the structure was determined and its originality was disclosed: a compact stacking of O-Cu-O dumbbells giving rise to oxygen double layers whose octahedral sites are occupied by iron atoms. Nearly all the trivalent elements of the periodic table seem able to accommodate this site: iron can be replaced by aluminum as well as by lanthanum or even by a couple $M'^{2+}M''^{4+}$.
With their 2D structure where trivalent atoms form a triangular lattice, with their electrical behaviors ranging from insulator to metal, delafossites are choice materials for basic studies such as, for instance, magnetic frustration or metal-insulator transitions. However, despite the catalytic properties of some of them, delafossites up to now are not used in large scale applications.
Growing needs for new materials in domains as different as *pn* transparent junctions or thermoelectric energy conversion (or cooling) are giving rise to a renewed interest for delafossites: will these oxides have a part to play among the tomorrow functional materials?