Abstract

Amorphous manganese oxide and binary copper manganese oxides were synthesized using the redox method, characterized, and tested in the catalytic oxidation of ethylene. The catalytic activity of the synthesized catalysts toward ethylene oxidation was high (100% conversion of 1.0% C_2H_4 at 200 °C with space velocity of $35,000\,\mathrm{mL\ h^{-1}\ g_{cat}^{-1}}$) and compared favorably with that of a commercial Hopcalite catalyst. The high catalytic activity was attributed a combination of factors including the poor crystallinity, the high surface areas ($\geq$163 $m^2\ g^{-1}$), porosity, presence of Mn^{4+} species, and compositional homogeneity of the synthesized copper manganese oxides. Incorporation of copper into the amorphous manganese oxide matrix significantly enhanced the catalytic activity of the resultant bimetallic oxides by increasing the reducibility and ease of removal of lattice oxygen species. The synthesized materials were characterized using FE-SEM, HR-TEM, BET, FAAS, XPS, and TPD methods.