Porous materials that undergo structural changes in response to external stimuli hold potential in molecular sensing and gas storage or separation applications. We have developed a new synthetic route for the assembly of a flexible metal-organic framework (MOF) constructed from reduced Cr(II) metal ions. The Cr(II) ions in this material are oxidized to Cr(III) upon exposure to O$_2$. Upon drying, the crystalline structure undergoes an accordion-like distortion and closing of the guest-accessible channels.