We present the first systematic study of the stability of the structure and electrical properties of FeCl$_3$ intercalated few-layer graphene to high levels of humidity and high temperature. Complementary experimental techniques such as electrical transport, high resolution transmission electron microscopy and Raman spectroscopy conclusively demonstrate the unforeseen stability of this transparent conductor to a relative humidity up to 100% at room temperature for 25 days, to a temperature up to 150 degrees C in atmosphere and to a temperature as high as 620 degrees C in vacuum, that is more than twice higher than the temperature at which the intercalation is conducted. The stability of FeCl$_3$ intercalated few-layer graphene together with its unique values of low square resistance and high optical transparency, makes this material an attractive transparent conductor in future flexible electronic applications.