The polyoxometalate (POM) anion of europium (III) decatungstate $[EuW_{10}O_{36}]^{9-}$ exhibits great luminescence quantum yields of approximately 67% but suffers reduced red light emissions that are due to the low $^5D_0 \rightarrow {}^7F_2$ transmissions. Fine tuning the microenvironment around $[EuW_{10}O_{36}]^{9-}$ anion through intercalation into different compositions of layered double hydroxides (LDHs) materials, greatly enhances the $^5D_0 \rightarrow {}^7F_2$ transmissions. The positive nanosheets in LDHs provide a conducive microenvironment for strong transitions of $^5D_0 \rightarrow {}^7F_2$ to occur. The ratio $I(^5D_0 \rightarrow {}^7F_2)/I(^5D_0 \rightarrow {}^7F_1)$ for the observed intensities vary from 0.44 for $[EuW_{10}O_{36}]^{9-}$ion to 14.08, 6.20, 1.75 and 1.59 in Mg_2Al-$EuW_{10}O_{36}$, LYbH-$EuW_{10}O_{36}$, Zn_2Al-$EuW_{10}O_{36}$ and LEuH-$EuW_{10}O_{36}$ materials respectively (Mg_2Al = magnesium aluminum LDHs, Zn_2Al = Zinc aluminum LDHs, LYbH = layered ytterbium hydroxide LDHs, and LEuH = layered europium hydroxide LDHs). As such, these materials can find a wide application in processes that require the red light luminescence.