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Unusual observation of optical property of V^{5+} substituted BPO_4 and its tunable redox features

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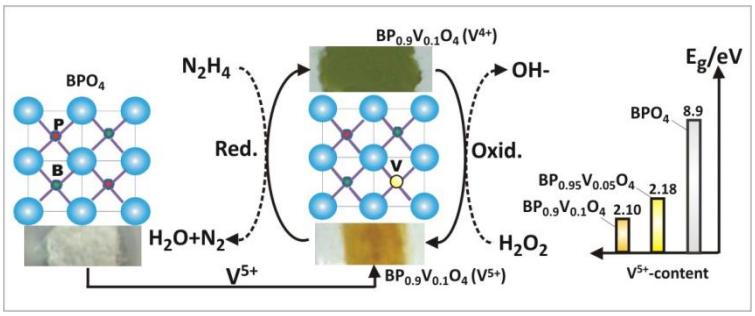
Graphical abstract



V^{5+} ion substitution results in an unusual reduction in the optical band gap of BPO_4 from ~8.9 eV to the value of ~2.2 eV ($BP_{1-x}V_xO_4$, x = 0.05 and 0.1). The newly developed phosphovanadates ($BP_{0.95}V_{0.05}O_4$ and $BP_{0.9}V_{0.1}O_4$) show absorbance edge in the visible region, possess stable yellow color and exhibit tunable redox features.

Highlights

(i) Partial substitution of V^{5+} ion for P^{5+} in BPO_4 hugely reduces the band gap of BPO_4 from 8.9 eV to the order of 2.2 eV.

(ii) The phosphovanadates colorimetrically detect hydrazine and hydrogen peroxide.