Supporting Information

Exfoliation of one-dimensional TiO$_5$ chain in K$_2$TiO$_3$

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1. XRD patterns for potassium titanates obtained from mixtures of KNO$_3$/TiO$_2$ in molar ratios of 2.0–2.3/1. Single phase K$_2$TiO$_3$ was obtained at a molar ratio of 2.2/1.

Fig. S1. XRD patterns for potassium titanate obtained from mixtures of KNO$_3$/TiO$_2$ in molar ratios of (a) 2/1, (b) 2.1/1, (c) 2.2/1, and (d) 2.3/1. Pattern (e) is a diffraction pattern calculated using crystallographic data for K$_2$TiO$_3$ [H. S. Khalsa, et al., Mater. Res. Bull., 2009, 44, 91-94]. Diffraction lines marked with open circles, filled triangles and diamonds were assigned to those of K$_2$TiO$_3$, K$_6$Ti$_4$O$_{11}$, and K$_6$Ti$_2$O$_7$, respectively.
2. SEM image of $\text{K}_2\text{TiO}_3$ obtained at $\text{K}:	ext{Ti} = 2.2:1$ indicates agglomerates of small particles (<1 $\mu$m).

Fig. S2. SEM image of $\text{K}_2\text{TiO}_3$ powder.

3. After 3 days, the average particle size decreased from ca. 800 nm to 300 nm, and the zeta potential increased from 0 V to 30 mV for the $\text{K}_2\text{TiO}_3$/HNO$_3$(aq) colloidal solution.

Fig. S3. Average particle size and zeta potential for the $\text{K}_2\text{TiO}_3$/HNO$_3$(aq) colloidal solution over time.
4. Potassium ion concentrations were analyzed by ICP-AES. 43.5 mg of as-prepared K$_2$TiO$_3$ powders (2.5×10$^{-4}$ mol) were dispersed in 100 mL of 1M-HNO$_3$ solution. The solution was separated from the colloidal particle through a cellulose nitrate filter (0.1 μm pore size) after each duration time. The saturated K$^+$ concentration was slightly higher than the starting material, maybe due to the K-rich composition of the starting mixtures and experimental error (weigh-in in a glove box). The line was drawn to represent the concentration change, excepting the value at 0 day because of insufficient equilibrium reaction in very short duration time.

Fig. S4. Potassium concentration of the colloidal solution dependent on duration time.
5. X-ray absorption spectra were measured for K$_2$TiO$_3$ and K$_2$TiO$_3$ in nitric acid solution to elucidate the local structure around Ti$^{4+}$ in the colloidal solution. The strong pre-edge peak at 4969 eV for the colloidal solution implies that Ti$^{4+}$ in the solution have distorted octahedral coordination with additional hydronium ions.

Fig. S5. Ti K-edge XANES spectra of K$_2$TiO$_3$ and K$_2$TiO$_3$ in nitric acid solution. The spectrum of TiO$_2$ (rutile) is also shown for reference.