Resonance of $KNbO_3$ nanofibers is effectively stimulated by ultrasound with low frequency and low power to enhance piezocatalytic activity

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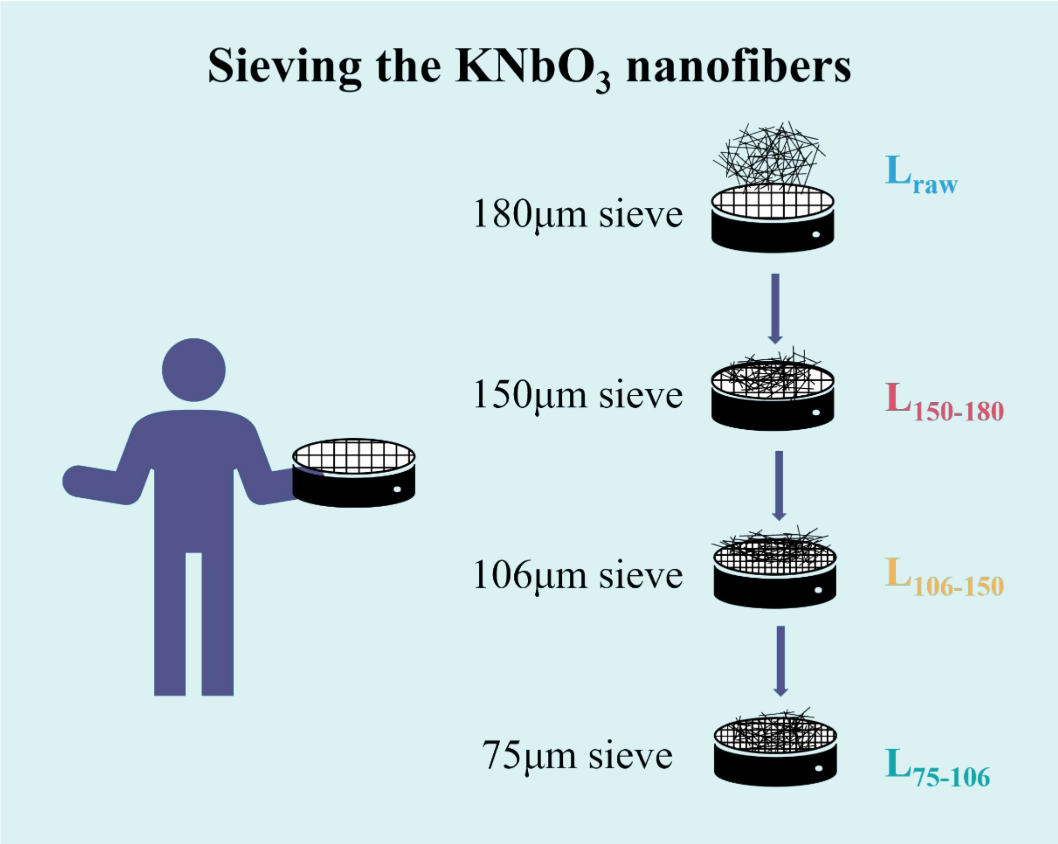

Scheme S1. The diagram of sieving $KNbO_3$ nanofibers.

The XRD patterns of $KNbO_3$ nanofibers treated with different calcination temperatures are shown in **Fig. S1**. The morphology of $KNbO_3$ nanofibers obtained at 500°C and 600 °C are shown in **Fig. S2**. The morphology of $KNbO_3$ nanofibers calcined at 500°C is similar to that of $KNbO_3$ nanofibers calcined at 550°C, with good homogeneity of both nanofibers. When the calcination temperature is increased to 600°C, a fracture of some of the nanofibers can be observed in **Fig. S2b**, which is probably due to the increase in grain size (the XRD results show an increase of about 3 nm in the grain size of the $KNbO_3$ nanofibers).

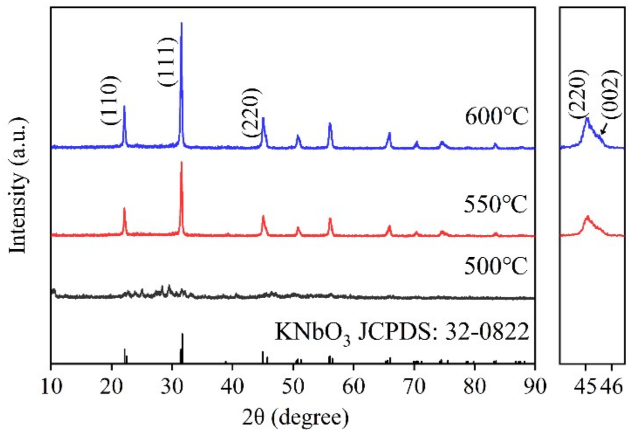

Fig. S1. XRD patterns of $KNbO_3$ nanofibers at different calcination temperatures.

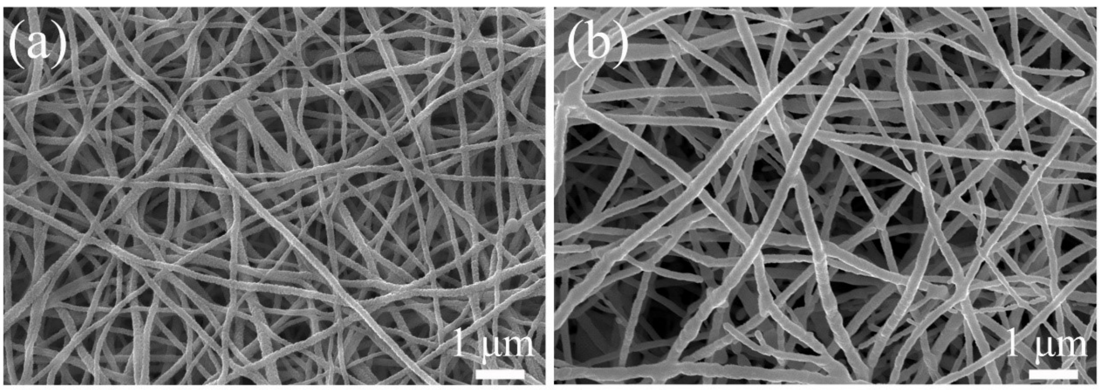

Fig. S2. SEM images of $KNbO_3$ nanofibers obtained at different calcination temperatures (a) 500°C, (b) 600°C.

The N_2 adsorption-desorption measurements of $KNbO_3$ nanofibers obtained at different calcination temperatures are shown in **Fig. S3**, and the corresponding specific surface area and pore volume are summarized in **Table S1**. All the isotherms are identified as type IV, with H3 hysteresis loops, suggesting their porous structure. As shown in **Table S1**, the BET surface area of $KNbO_3$-550 and $KNbO_3$-600 are 12.099, and 5.891m^2/g, respectively. The smaller BET surface area of the latter may be due to the increase in crystalline size caused by the increase in calcination temperature, which results in grain build-up and a reduction in pores.

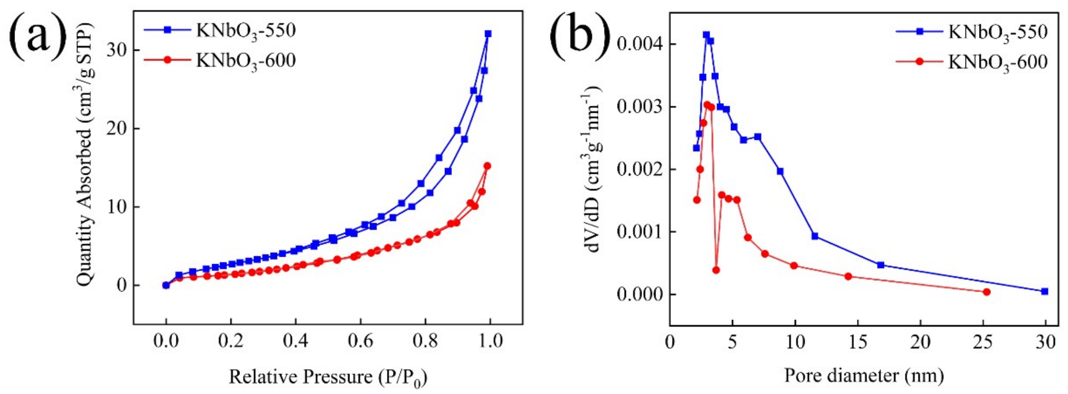

Fig. S3. (a)N_2 adsorption-desorption curve and (b) BJH pore size distribution of $KNbO_3$ nanofibers.

Table S1. Specific surface area and total pore volume of $KNbO_3$ nanofibers.

samples	S (m^2/g, BET)	Pore volume (m^3/g, BET)
$KNbO_3$-550	12.099	0.050
$KNbO_3$-600	5.891	0.024

Table S2. Length of $KNbO_3$ nanofibers at natural frequencies close to 20 kHz, 30 kHz, and 40 kHz.

Natural frequency (kHz)	Length (μm)
20	154-155
30	122-123
40	103-104

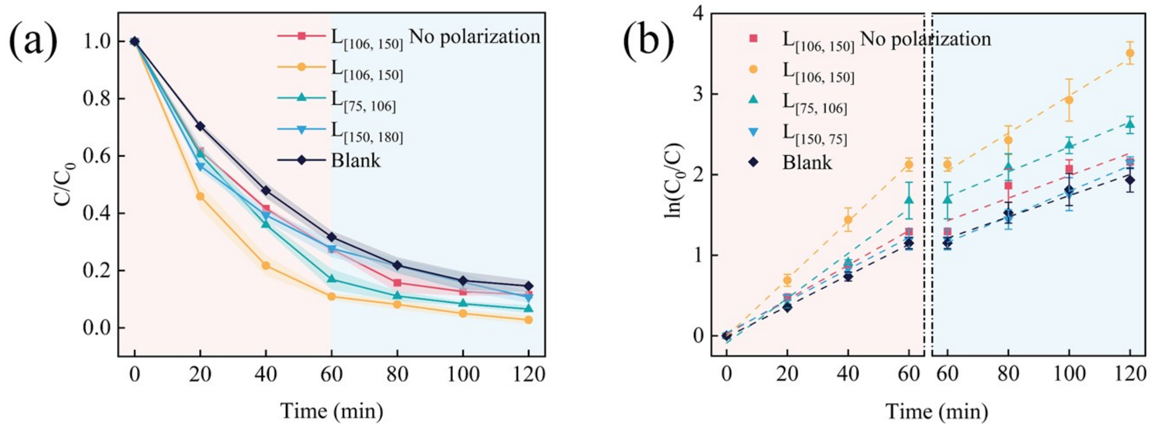

Fig. S4. The degradation curve(a) and the corresponding kinetic curves(b) of $KNbO_3$ nanofibers with and without a polarization at ultrasound frequencies of 30 kHz.

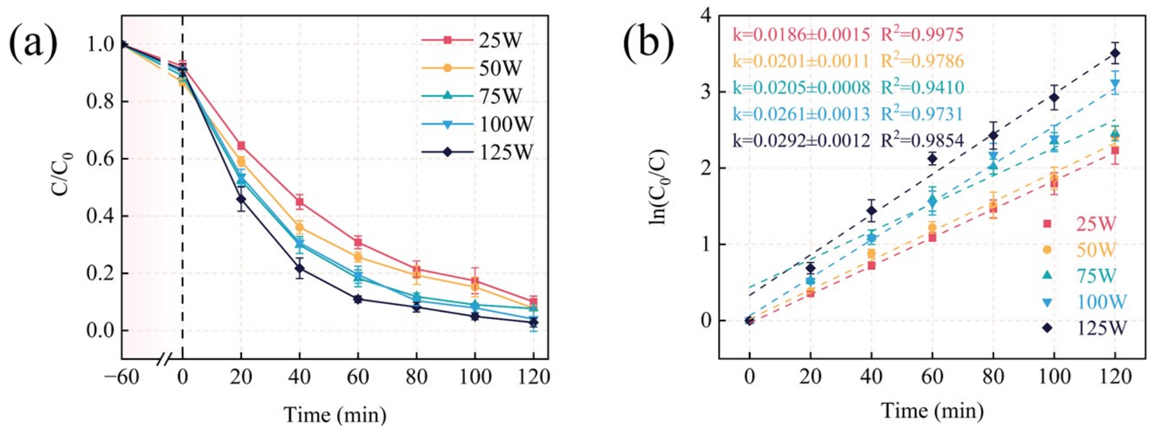

Fig. S5. The degradation curve(a) of $KNbO_3$ nanofibers with diameters in range of 106-150 nm at different applied ultrasonic power and the corresponding kinetic curves(b). The ultrasound frequency is fixed at 30 kHz.

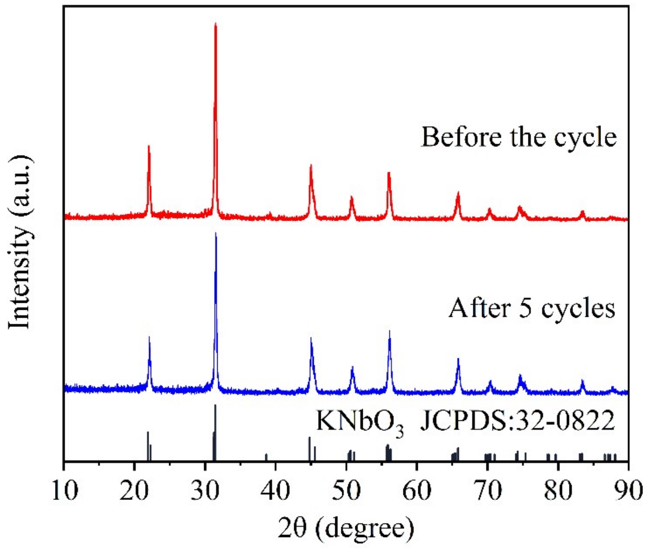

Fig. S6. XRD patterns of $KNbO_3$ nanofibers before and after 5 cycles.

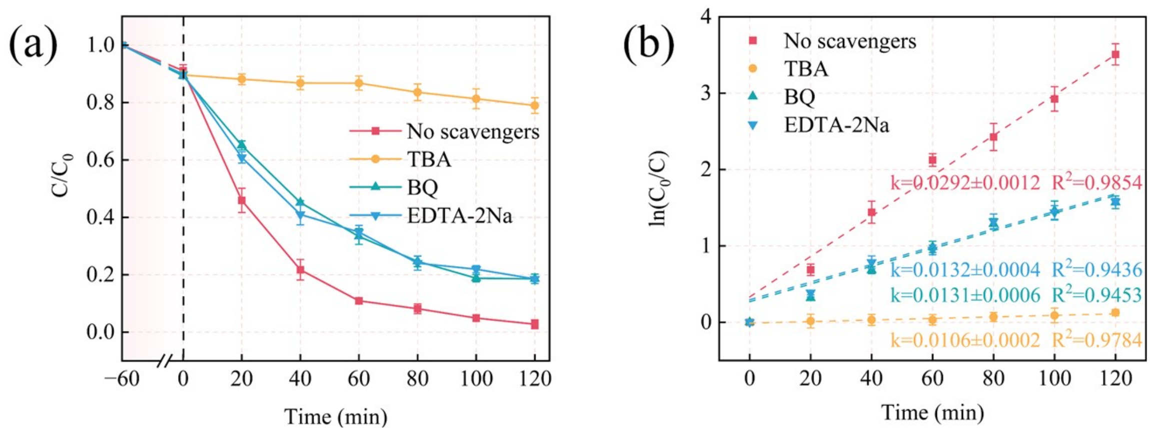

Fig. S7. The degradation curve(a) of $L_{[106, 150]}$ in the presence of ·OH(TBA), $\cdot O^{2-}$(BQ), and h^+(EDTA-2Na) scavengers and the corresponding kinetic curves(b). The ultrasonic frequency and power are fixed at 30kHz and 125W, respectively)

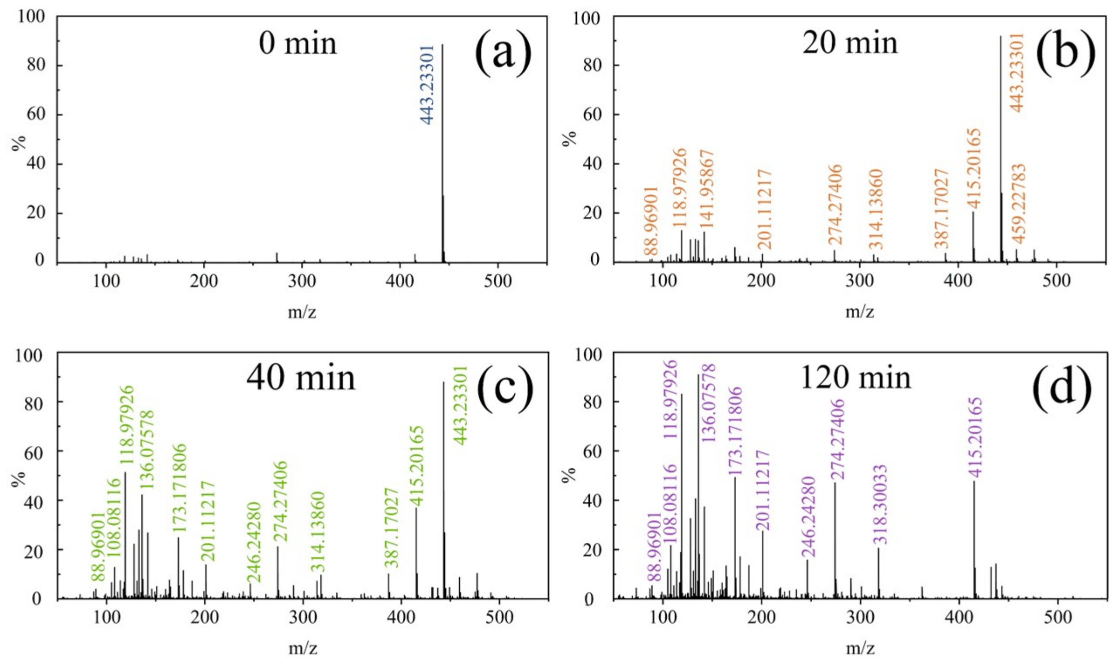

Fig. S8. Mass spectra for initial RhB(a) and RhB degradation in 20min(b), 40min(c), and 120min(d).

Table S3. Comparison of piezocatalytic activity with other catalysts.

Catalysts (mg)	Pollutants (mg/L, mL)	Ultrasonic (kHz, W)	Degradation (%)	Kinetic constant ($min^{-1}/(g\cdot L^{-1})$)	Ref.
$KNbO_3$ NF (20mg)	RhB 5mg/L, 100mL	30kHz, 100W	96.02	5.21	This work
$KNbO_3$ NF (20mg)	RhB 5mg/L, 100mL	30kHz, 25W	92.7	3.72	This work
$KNbO_3$ NS (50mg)	RhB 10mg/L, 100mL	40kHz, 110W	32.40	0.375	[S1]
$KNbO_3$ NC (50mg)	RhB 10mg/L, 100mL	40kHz, 110W	9	0.13	[S1]
$KNbO_3$ NP (100mg)	MO 10mg/L, 100mL	40kHz, 120W	36.5	0.55	[S2]
O-$KNbO_3$ NF (50mg)	RhB 10mg/L, 50mL	40kHz, 120W	13.9	0.221	[S3]

$KNbO_3$ NP (100mg)	DLB 5B 5mg/L, 100mL	45kHz, 120W	42.3	0.244	[S4]
$KNbO_3$ NS (10mg)	Orange II 10mg/L, 200ml	40kHz, 110W	76.4	1.25	[S5]
$KNbO_3$ NC (50mg)	RhB 10mg/L, 50mL	40kHz, 120W	85.6	1.826	[S6]
$KNbO_3$ NP (100mg)	Ketamine 10mg/L, 100ml	40kHz, 300W	60	0.39	[S7]
$KNbO_3$ NS (10mg)	RhB 10mg/L, 50mL	40kHz, 300W	87.5	1.55	[S8]
$KNbO_3$ NP (100mg)	MB 10mg/L, 500mL	20kHz, 375W	30	0.53	[S9]

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