Supplementary material

Porous Hybrid PVDF/BiFeO3 Smart Composite with Magnetic, Piezophotocatalytic, and Light-Emission Properties

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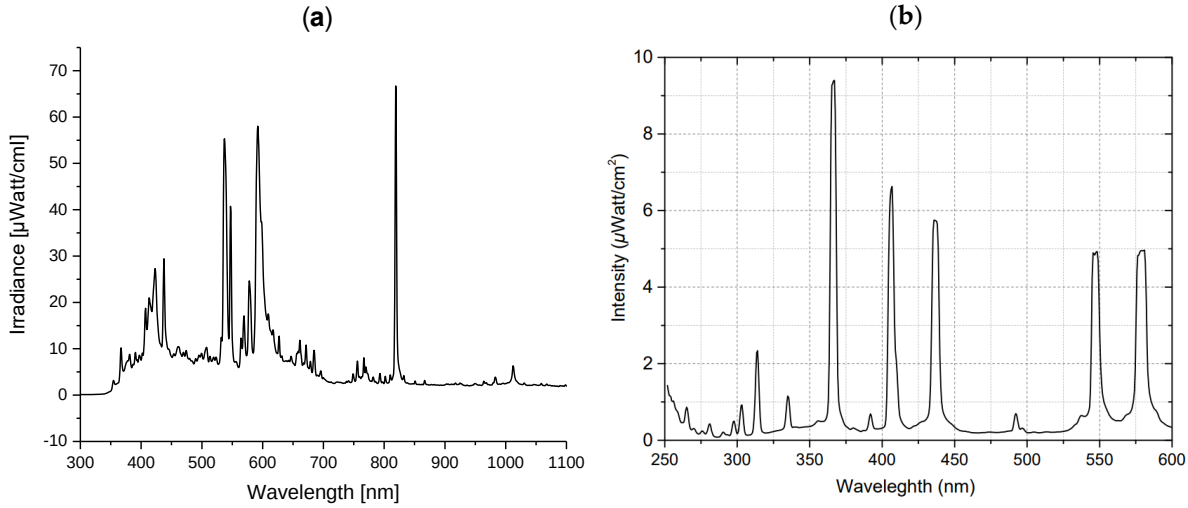

Figure S1. Emission spectra (**a**)—70 W metal halide lamp used as a source of visible light, (**b**)—250 W discharge mercury vapor lamp with a preliminary removed phosphor layer.

(**A**) (**B**)

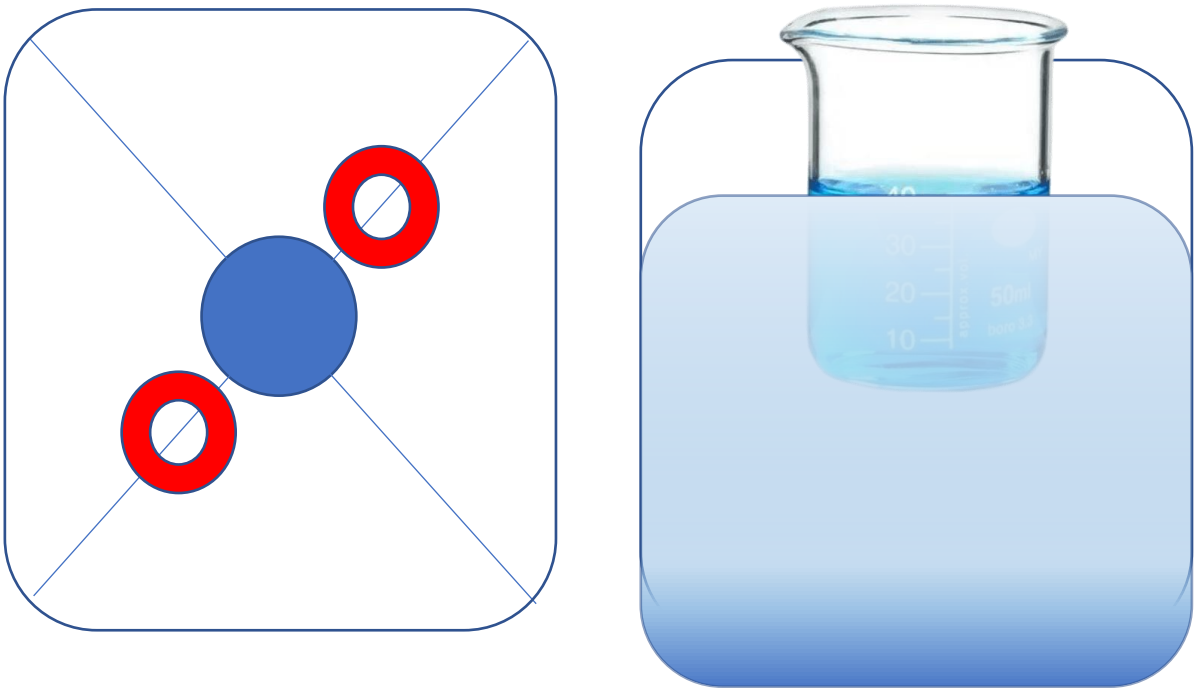

Figure S2. Scheme of the location of the glass in the ultrasonic bath. (**A**) Top view (**B**) Side view.

The figure shows a schematic representation of a piezocatalytic experiment. The scale is not maintained. Inner tank size is 150 × 135 × 100 mm. Chemical baker size is 60 × 45 mm. The red color indicates the location of the piezoelectric emitters. 1.5 L of water was poured into the bathroom. The glass was lowered into the bath to the level of the solution.

Signal measurements of the manufactured PENG were made using the Arduino UNO R3 programmable board in the Arduino 1.8.19 application, a 2 MΩ resistor was also used in the circuit to eliminate unwanted noise Figure S3.

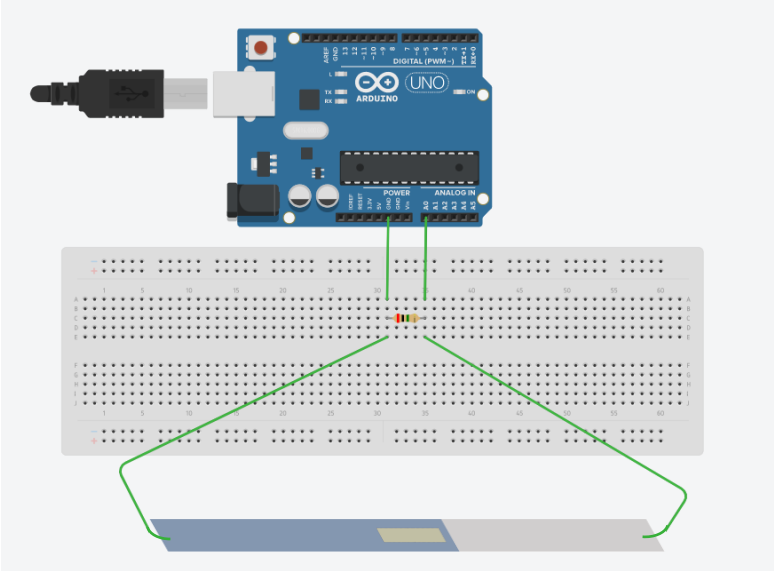

Figure S3. Scheme of signal measurements of the manufactured PENG.

The program that reads and converts the input signals to the Arduino microcontroller into voltage was written using Chat GPT, to extract the obtained values, the program for writing Arduino serial output to CSV/Excel (Windows/Mac/Linux) downloaded from the site was used: https://circuitjournal.com/arduino-serial-to-spreadsheet.

```
// Declaring Variables
int pin = A0;          // Pin to which the voltage is connected
int delayTime = 50;    // Delay between reads
int readings[10];      // Array with values for smoothing
int index = 0;         // Index for the array
float voltage = 0.0;   // Variable for voltage storage

void setup() {
  Serial.begin(2000000);  // Initialization the communication port
}

void loop() {

  // Read the voltage from the ADC
  int reading = analogRead(pin);

  // Adding the read value to the array
  readings[index] = reading;

  // Increasing the index
  index++;
```

```
  // If the index is greater than 9, then set it to 0
  if (index > 9) {
    index = 0;
  }

  // Adding up 10 read values
  int total = 0;
  for (int i = 0; i < 10; i++) {
    total += readings[i];
  }

  // Find the arithmetic mean of 10 read values
  float average = total / 10.0;

  // Calculate the voltage
  voltage = average * (5.0 / 1023.0);

  // Output voltage and running average values
  Serial.print("Voltage: ");
  Serial.print(voltage);
  Serial.print("V, Running Average: ");
  Serial.println(average);

  // Delay
  delay(delayTime);
}
```

Table S1. Comparison table for piezocatalysis.

#	Catalyst	Pollutant	Exp Setup	Time	Deg effic	
1.	PVDF + WS_2	MB dye (2.5 mg L−1)	------	240 min	44%	[1]
2.	E-MoS2/PVDF EFMs	Oxytetracycline 20 mg/L	20 kHz 650 W	24 min	93.08%	[2]
3.	Ag@LiNbO3/PVDF diameter of 2.5 cm	MB, 5, V 10 mL	70 W power and 40 kHz	120 min	89	[3]
4.	MoS2-PVDF 2 cm × 2 cm and thickness 50 μm	Acridine orange, Eosin Y, Ethidium bromide Rhodamine B 10 mL 10 ppm	100W	20 min	>90%	[4]
5.	ZnO@PVDF diameter of 3 cm	MO 5 mL 5 ppm	80 kHz, 700 W	360 min	55.29%	[5]
6.	PVDF–BaTiO3 2.5 cm × 2.5 cm × 2 mm	30 mL RhB solution (10 mg L−1)	180 W	80 min	87%	[6]
7.	PVDF-ZnSnO3-Co3O4	30 mL of 5 mg/pL MB	120 W 33±3 kHz	20 min	100%	[7]
8.	PVDF/CTAB 3-1 cm2	20 ml MB 1mgL	250 W 18kHz	60 min	73%	[8]
9.	PVDF@Ag-ZnO/Au	rhodamine B (RhB) and malachite green (MG) 10mg/L 50ml	200 W; 40 kHz	120 min	~35%	[9]
10	PVDF/BFO	20 ml MB 1mgL	120 W 40 kHz	60 min	95%	This work

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