Supporting Information

Broadband optical nonlinearity of zeolitic imidazolate framework-8 (ZIF-8) for Ultrafast Photonics

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Bandgap of ZIF-8

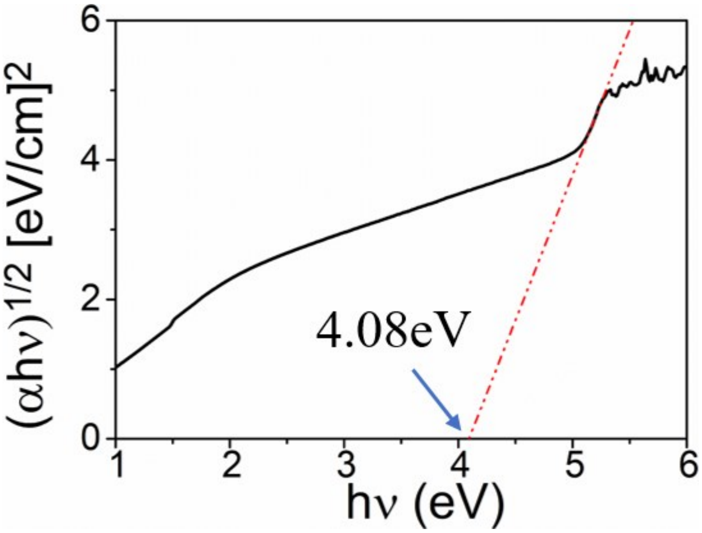

Fig. S1. The bandgap results of the as-prepared ZIF-8 sample.

Table S1. Laser sources parameters of the Z-scan equipment.

Wavelength (nm)	Pulse duration (ns)	Repetition rate (kHz)
1064	50	3
1342	50	2
1914	50	2

Q-switched laser configuration

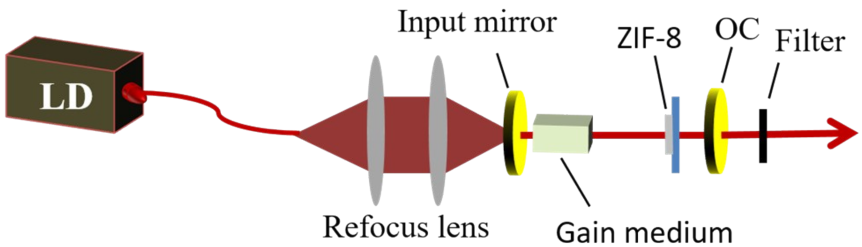

Fig. S2. Schematic diagram of the ZIF-8 PQS lasers.

The schematic diagram of the experimental setup was illustrated in Fig. S2. A compact two-mirrors resonator cavities with different cavity length were constructed to implement the ZIF-8 PQS lasers operation at 1.06, 1.34, and 1.91 μm. The specific parameters of the cavity length and optical equipment were listed in Table S2. To manage the thermal effects, the gain crystals were wrapped with indium foil and mounted on a copper heat-sink, to be cooled the crystals at 17 °C thermoelectrically during the experiments. The ZIF-8 saturable absorber was inserted into the cavity close to the OC. The pulse temporal behavior and output power performances were recorded by a phosphor oscilloscope (DPO 7104C, Tektronix Inc.) with a high-speed an InGaAs detector (EOT) and a power meter (MAX 500AD, Coherent Inc.), respectively.

Table S2. Setup Details of the ZIF-8 PQS lasers.

Wavelength -cavity	**Wavelength -pump**	**Input mirror**	**Gain medium**	**OC Transmittance**	**Cavity length**
1064nm	808nm	Plane mirror 808nm HT 1064nm HR	Composite $Nd:GdVO_4$: c-cut, (0.1+0.3+0.8)at.% doped, 3×3×(3+3+4) mm^3	T=10%	45mm
1342nm	808nm	Plane mirror 808nm HT 1342nm HR		T=5.8%	25mm
1914nm	794nm	R=200 mirror 794nm HT 1878nm HR	Tm:YLF: a-cut, 3.0 at.% doped, 3×3×10 mm^3	T=1%	22mm

Broadband ZIF-8 PQS laser performances

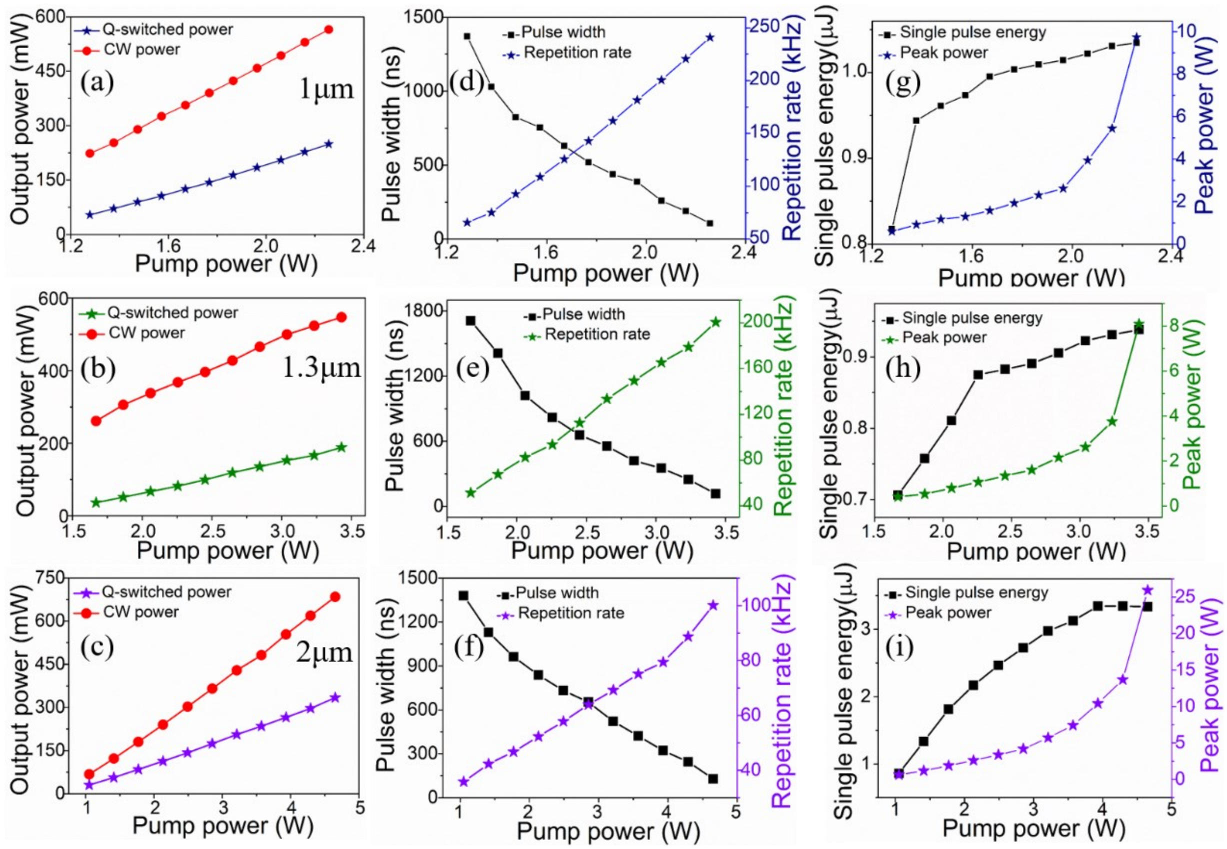

Figure S3. Broadband ZIF-8 PQS performances: (a-c) Average output power of the CW and Q-switched lasers at 1.06, 1.34 and 1.91 μm, respectively. (d-f) Pulse width and repetition rate versus the incident pump power at 1.06, 1.34 and 1.91 μm, respectively. (g-i) Single pulse energy and peak power versus the incident pump power at 1.06, 1.34 and 1.91 μm, respectively.

The preparation of the ZIF-8 SA for mode-locked YDFL

The ZIF-8 SA was prepared by the light deposition method. Firstly, we connected an optical fiber patch cord to a 976 nm laser diode, and inserted the cleaned FC/APC end face into the above-prepared ZIF-8 supernatant. Increased the pump power until the output power from the fiber patch cord was around 20 mW. The deposition lasted for an hour, and then dried it naturally. In order to prove that the material had been attached to the end face, we compared the blank and ZIF-8 attached end face of the fiber patch cord under the microscope. As shown in Fig. S4, the ZIF-8 nanomaterial was observed to be evenly distributed on the FC/APC end face, evidencing the effectiveness of the deposition. Then we utilized a flange to connect it to another blank fiber patch cord and coupled it into the mode-locking ring cavity.

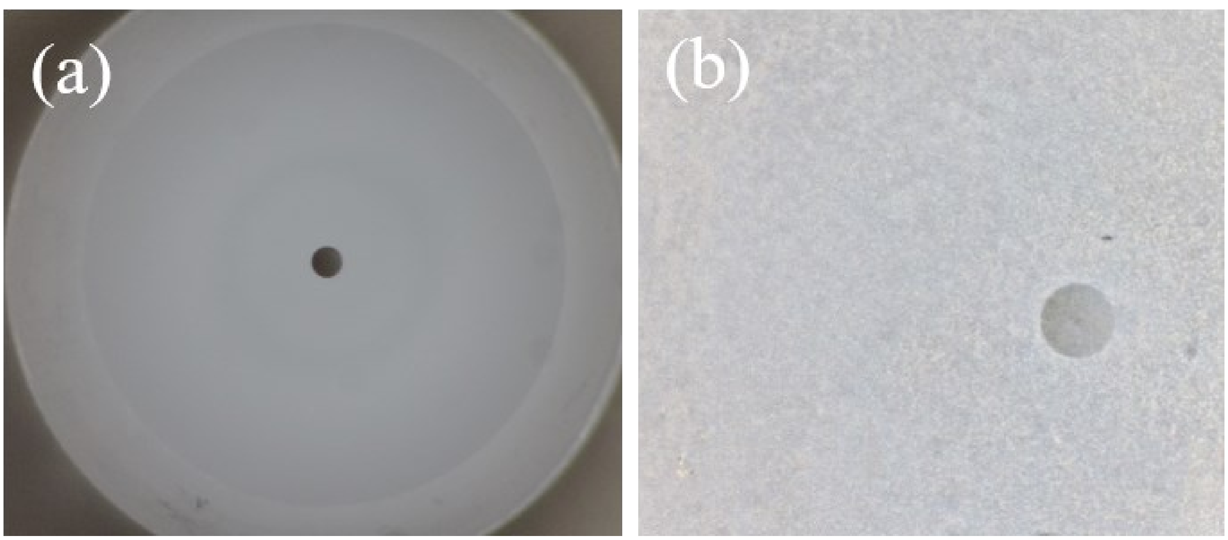

Figure S4. The image of (a) the blank, (b) the ZIF-8 attached FC/APC end face of the fiber patch cord after deposition under the microscope.