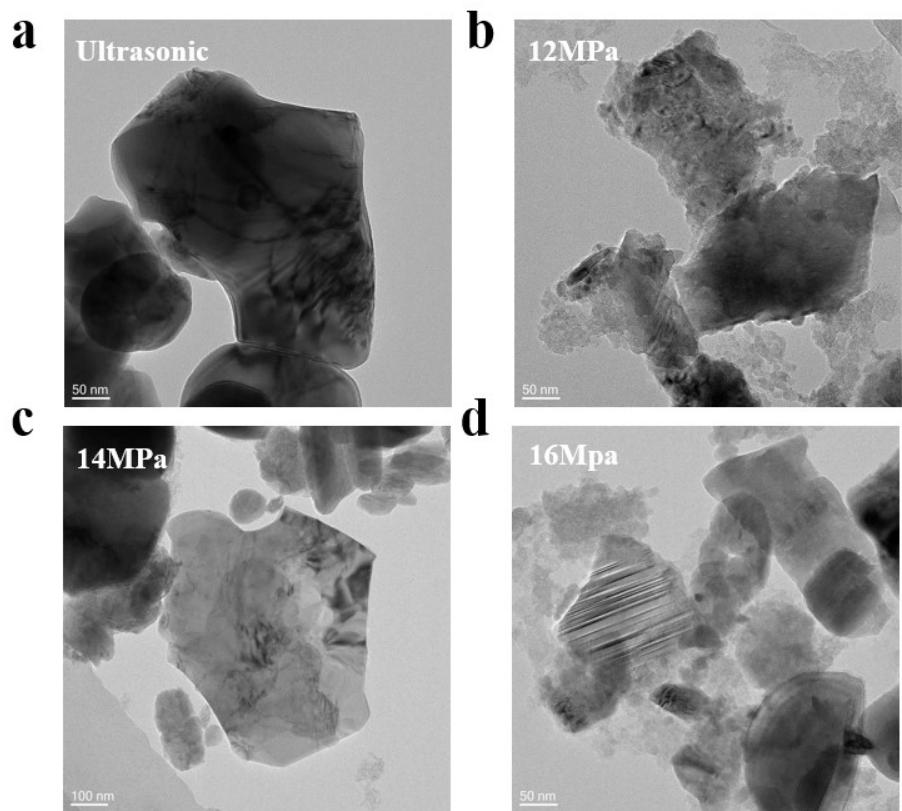


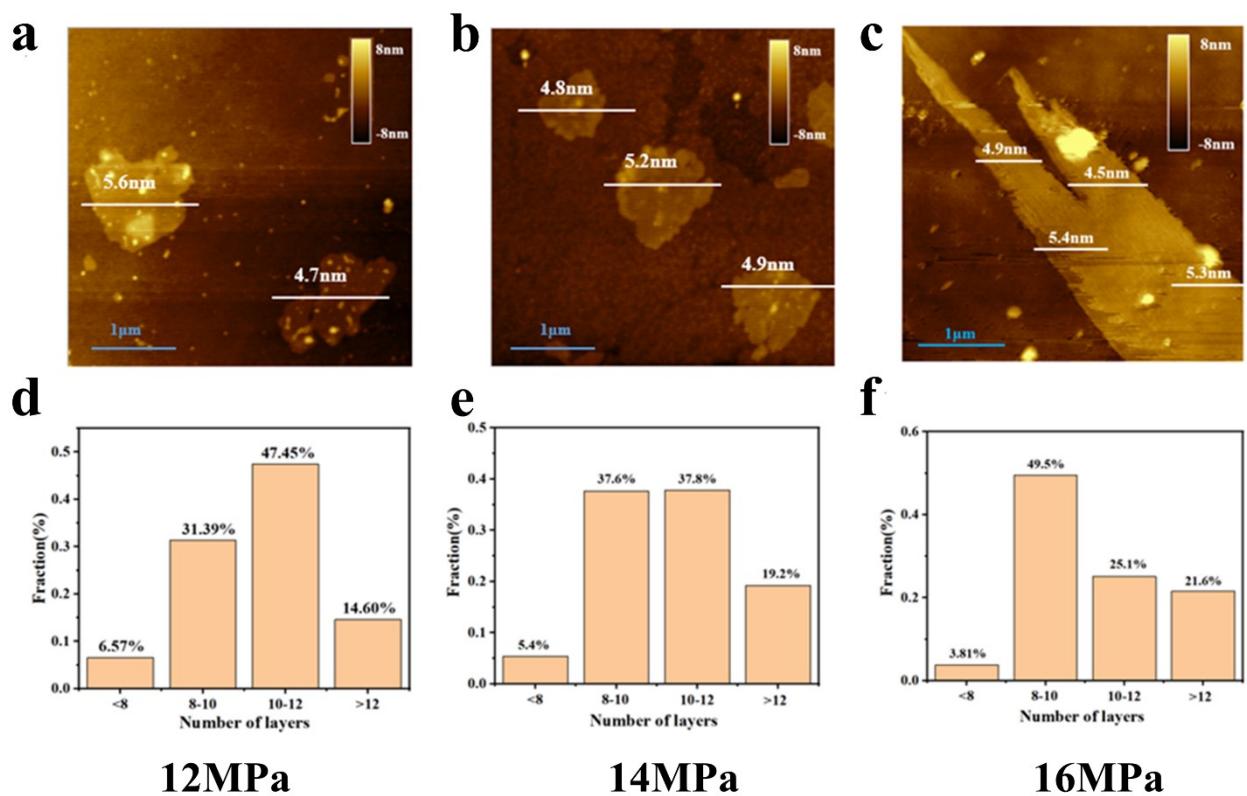
## Supporting Information

### **Supercritical CO<sub>2</sub>-induced plastic deformation on two-dimensional SrZrO<sub>3</sub> for its multiferroic performance**

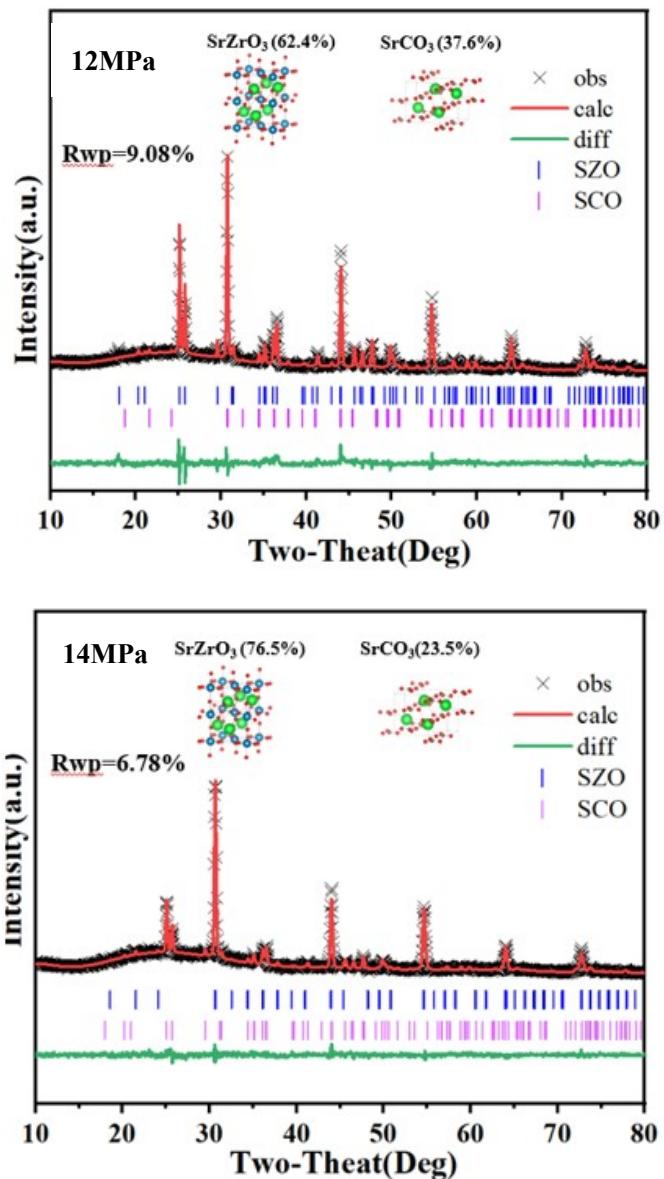
*Yapeng Dong, Yuning Liang, BoGao, Qun Xu\**



**Fig. S1.** Low magnification TEM images of the different structures.



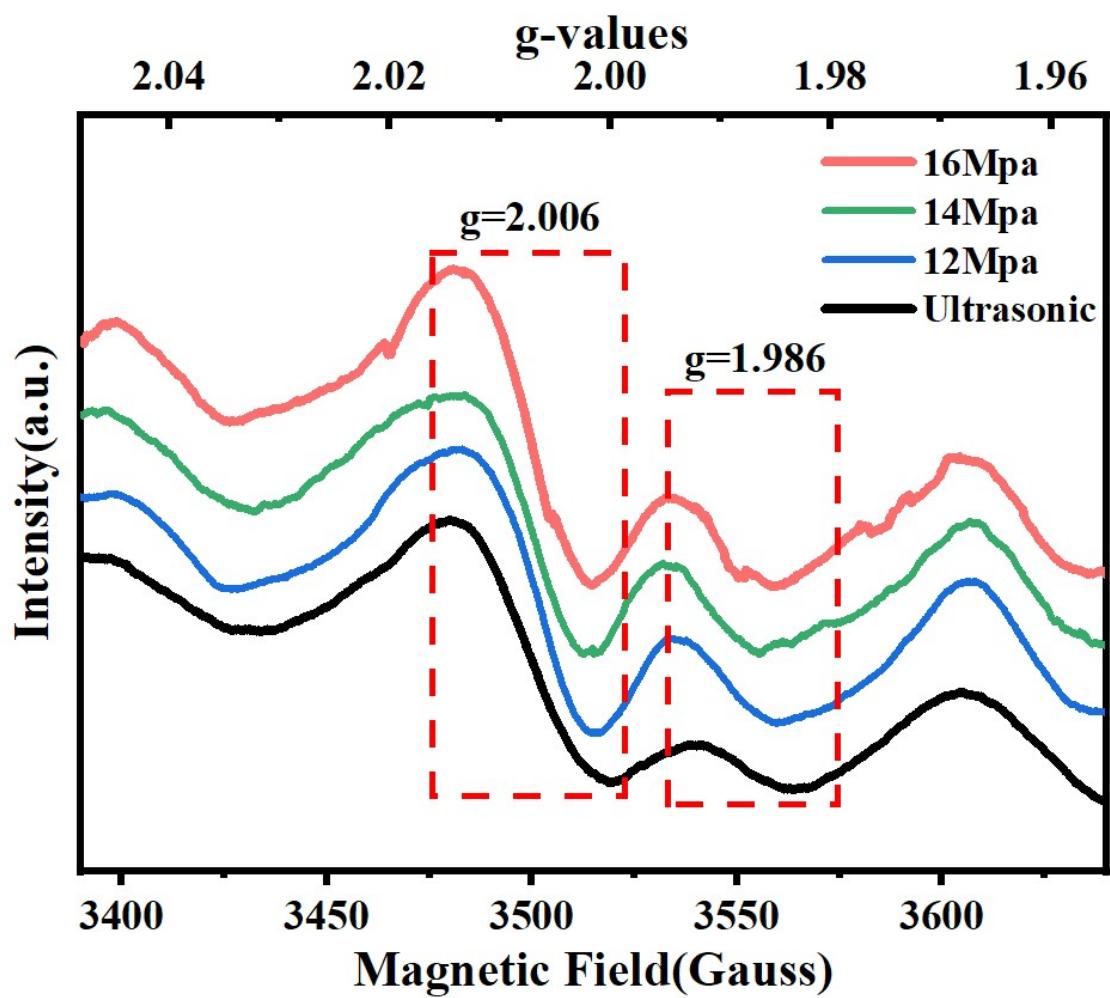
**Fig. S2.** a-c) AFM image of nanosheets. d-f) Thickness distribution diagram of (a-c).



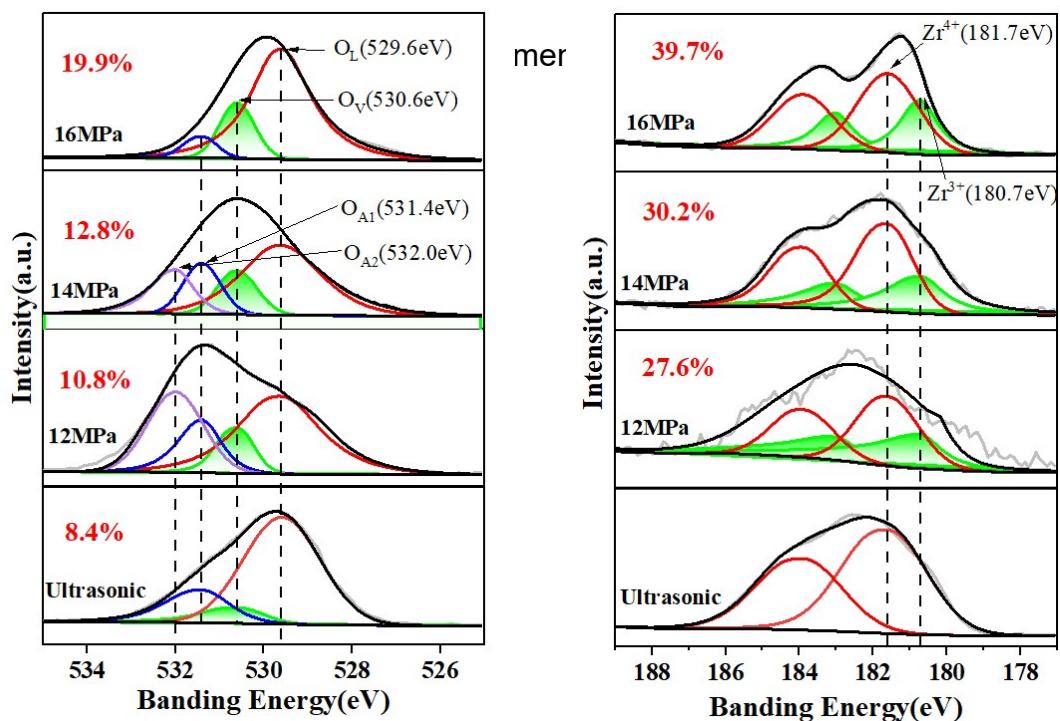
**Fig. S3.** XRD refinement results of 12MPa and 14MPa

**Table S1.** Surface lattice constants obtained by XRD refinement

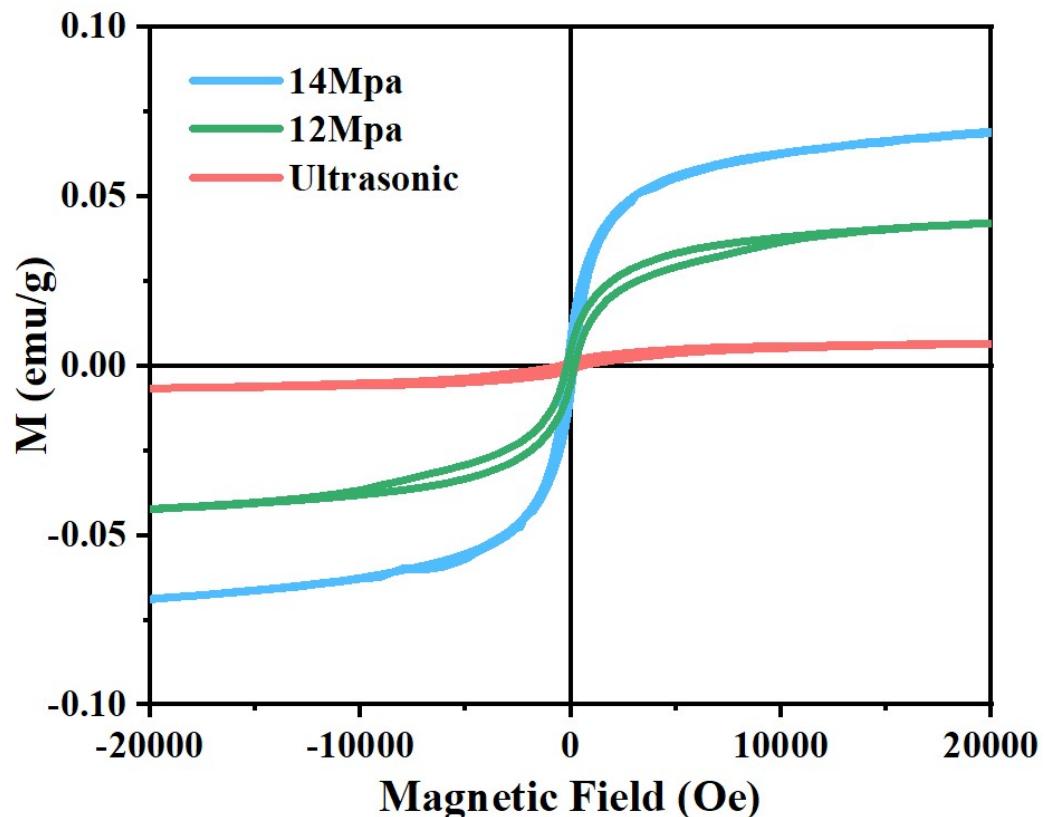
|           | a       | b       | c       | V       |
|-----------|---------|---------|---------|---------|
| Urtasonic | 5.79378 | 5.80784 | 8.20402 | 276.091 |
| 12Mpa     | 5.79443 | 5.80979 | 8.20512 | 276.348 |
| 14MPa     | 5.79619 | 5.81916 | 8.20642 | 276.635 |
| 16MPa     | 5.79567 | 5.82023 | 8.20612 | 276.810 |



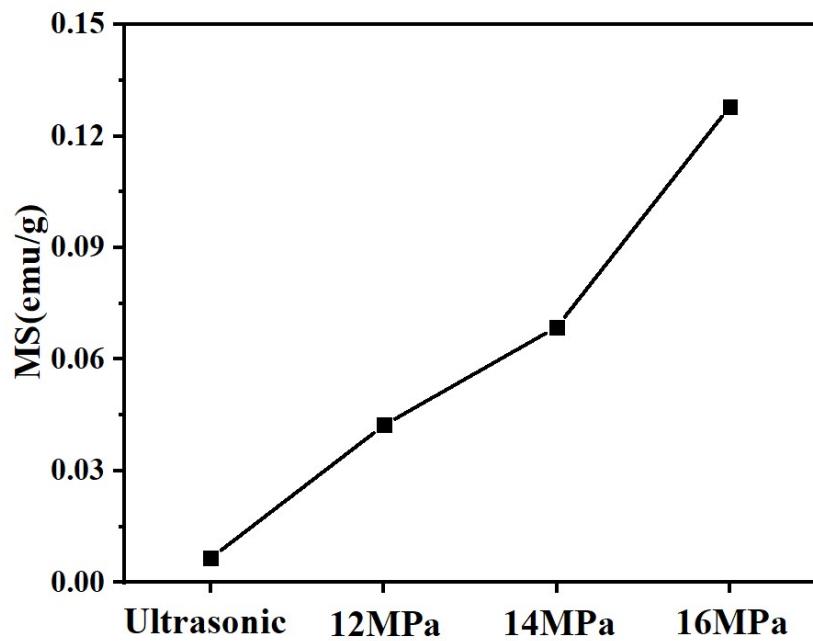
**Fig. S4.** Electron paramagnetic resonance (EPR) from 12 MPa to 16 MPa SC CO<sub>2</sub>



**Fig. S5.** Characterization of  $\text{SrZrO}_3$  treated with different pressure SC  $\text{CO}_2$ . a) XPS  $\text{O}_{1s}$ . b) XPS  $\text{Zr}_{3d}$ . The percentages in figures 3a and 3b represent the content of  $\text{O}_V$  and  $\text{Zr}^{3+}$  respectively.



**Fig. S6.** Hysteresis lines of samples obtained from 12 MPa and 14 MPa SC  $\text{CO}_2$  treatment



**Fig. S7.** Schematic diagram of the variation of saturation magnetisation intensity with pressure of SC CO<sub>2</sub>.

**Table S2.** The magnetic properties of nanosheets under different pressure of CO<sub>2</sub>.

|            | Saturation magnetization (emu/g) | Remanent magnetization (emu/g) | Coercive force (Oe) |
|------------|----------------------------------|--------------------------------|---------------------|
| 16MPa      | 0.1280                           | 0.0146                         | 124                 |
| 14MPa      | 0.0687                           | 0.0080                         | 149                 |
| 12MPa      | 0.0423                           | 0.0051                         | 174                 |
| Ultrasonic | 0.0066                           | 0.0012                         | 549                 |