SUPPLEMENTARY INFORMATION
High-pressure properties of TiP$_2$O$_7$, ZrP$_2$O$_7$ and ZrV$_2$O$_7$

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Fig. 4. High-pressure diffraction patterns of TiP$_2$O$_7$. (a) 0.05 – 5.79 GPa. Pressure medium was methanol-ethanol (4:1). (b) 6.28 – 40.3 GPa. Pressure medium was nitrogen. Peaks that have a contribution from δ-N$_2$ (below 18.7 GPa) and ε-N$_2$ (18.7 GPa and higher pressures) are indicated with triangles.

Fig. 5. High-pressure diffraction patterns of ZrP$_2$O$_7$. (a) 0.14 – 8.34 GPa. Pressure medium was methanol-ethanol (4:1), and for clarity only every second collected pattern is shown. (b) 4.17 – 20.5 GPa. Peaks that have a contribution from δ-N$_2$ and ε-N$_2$ (20.5 GPa) are indicated with triangles. Stars represent peaks due to the stainless steel gasket.

Fig. 6. Powder diffraction patterns for ZrV$_2$O$_7$. The diagram should be viewed from bottom to top. The pressure induced transition, α – β ZrV$_2$O$_7$ is shown to be fully reversible.

Fig. 7. Powder diffraction profile fits of TiP$_2$O$_7$. (a) At 0.05 GPa with methanol-ethanol (4:1) as pressure medium. (b) At 18.7 GPa with nitrogen as pressure medium.

Fig. 8. Powder diffraction profile fits of ZrP$_2$O$_7$. (a) At 1.69 GPa with methanol-ethanol (4:1) as pressure medium. (b) At 11.0 GPa with nitrogen as pressure medium.

Fig. 9. Powder diffraction profile fits of ZrV$_2$O$_7$. Pressure medium was methanol-ethanol (4:1). (a) α-ZrV$_2$O$_7$ at 0.15 GPa. (b) β-ZrV$_2$O$_7$ at 2.97 GPa, fitted using the small tetragonal unit-cell. (c) β-ZrV$_2$O$_7$ at 2.97 GPa, fitted using the large orthorhombic supercell.
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Figure 4.
Supplementary Information

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Figure 5
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Figure 6
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Figure 7

(a)

(b)
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High-pressure properties of TiP₂O₇, ZrP₂O₇ and ZrV₂O₇,
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Figure 8

(a)

(b)
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High-pressure properties of TiP$_2$O$_7$, ZrP$_2$O$_7$ and ZrV$_2$O$_7$.
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Figure 9