## PCP3-5

# Effect of non-magnetic rare earth substitution for *A*site on mixed anion *APX*superconductors

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Non-magnetic rare earth atom substitution effect for *A*site in *APX*-based Zr(P, S)$_2$system, Hf(P, Se)$_2$and Hf(P, S)$_2$superconductors (see Fig. (a)) for improvement of superconducting transition temperature ($T_c$) have been examined.

In Zr (P, Se)$_2$[1], the $T_c$improvement with partial substitution of an non-magnetic rare earth Lu atom for Zr site and the doping behavior by partial substitution were discussed [2, 3]. By partially substituting an non-magnetic rare earth Lu atom for Zr site in ZrPS, the lattice constants *a*and *c*decrease monotonically with increasing nominal substitution *y*in contrast to the case of non-magnetic rare earth substitution of Zr sites in Zr (P, Se)$_2$[1]. It is shown that the maximum $T_c$for ZrPS was increased from 3.70 K [1] to 6.36 K (see Fig. (b)). In $HfP_{1.55}Se_{0.45}$, lattice constants *a*decrease and *c*increasing monotonically with increasing nominal substitution *y*when Lu atoms are partially substituted for Hf atoms. $T_c$was also increased from 4.88 K [1] to 5.89 K. In $HfP_{1.45}S_{0.55}$, lattice constants *a*decrease slightly and *c*increasing monotonically with increasing nominal substitution *y*when Lu atoms are partially substituted for Hf atoms. $T_c$was also increased from 3.16 K [1] to 5.86 K. In this presentation, the doping behavior by partial substitution and the increase of $T_c$is discussed.

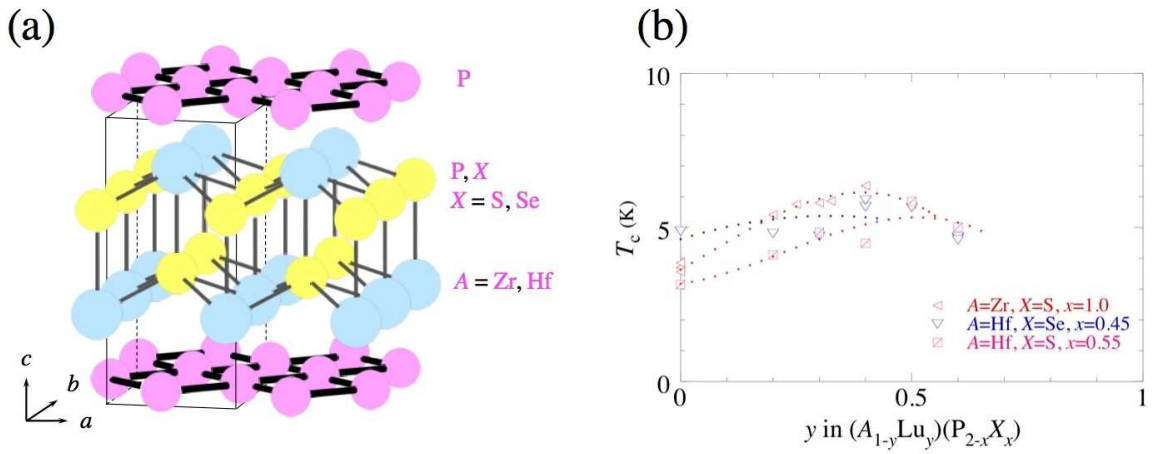


Fig. (a) The crystal structure for PbFCl-type $AP_{2-x}X_x$(*A*=Zr, Hf; *X*=S, Se), (b) $T_c$dependence on substitution nominal amount *y*for $(A_{1-y}Lu_y)(P_{2-x}X_x)$ (*A*=Zr, Hf;*X*=S, Se).

[1] H. Kitô *et al.* J. Phys. Soc. Jpn. 83 (2014) 074713.
[2] H. Kitô *et al.* J. Phys. Conf. Ser. 1054 (2018) 012003.

[3] K. Iwakiri *et al.*, J. Phys. Conf. Ser. 1054 (2018) 012002.

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