Abstract Submitted
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**Chlorine-doping effects on crystal structure and superconductivity in $FeSe_{1-x}Cl_y$**[1] H.H. SUNG, R.R. HU, S.C. CHEN, W.H. LEE, National Chung Cheng University, W.H. LEE TEAM — According to the assessed Fe-Se phase diagram,[2] the FeSe compound could crystallize either in tetragonal Pb-O type structure with space group P4/nmm (called $\beta$ FeSe) or hexagonal Ni-As type structure with space group $P6_3/mmc$ (called $\delta$ FeSe) depending on the materials preparation process. In general, different starting composition of $FeSe_x$ results in a mixture of superconducting phase with almost identical $T_c$ and different amounts of magnetic impurity, therefore, it was proposed that the tetragonal $\beta$-FeSe superconducting phase ($T_c \sim 8$ K) only exists in a very narrow Se-deficiency range.[3] Our experimental data indicated that the single hexagonal $\delta$ phase sample could be obtained by carrying out the low-temperature (400 °C) annealing for $FeSe_xCl_y$ after reaction at 680 °C. This result is contrary to what is observed in the FeSe system in which the tetragonal $\beta$ phase is the predominant stable one at the low annealing temperature 400 °C. As compared with the $\beta$-FeSe superconductor reported in the literature, higher $T_c$ values ($> 8$ K) and larger superconducting volume fraction could be achieved by suitable tuning and heat treatments in the $FeSe_xCl_y$ system.

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[2] "Binary Alloy Phase Diagrams" $2^{nd}$ edition, ASM International, Editor-in-Chief: Thaddeus B. Massalski, pp 1769-1770 (1992).
[3]Zhaofei Li, et. al., J. Phys. & Chem. Solids, **71**, 495-498 (2010).

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