

Abstract Submitted  
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**Charge Density Wave Instability and Soft Phonon in  $APt_3P$  ( $A=Ca, Sr, \text{ and } La$ )**<sup>1</sup> CHAO CAO, HUI CHEN, XIAOFENG XU, JIANHUI DAI, Hangzhou Normal University, HANGZHOU NORMAL UNIVERSITY CONDENSED MATTER PHYSICS GROUP TEAM — The electronic and phonon properties of the platinum pnictide superconductors  $APt_3P$  ( $A=Ca, Sr, \text{ and } La$ ) were studied using first-principles calculations. The spin-orbit coupling effect is significant in  $LaPt_3P$  but negligible in  $CaPt_3P$  and  $SrPt_3P$ . Moreover,  $SrPt_3P$  has been demonstrated to exhibit an unexpected weak charge-density-wave (CDW) instability which is neither simply related to the Fermi-surface nesting nor to the momentum-dependent electron-phonon coupling alone. The instability is absent in  $CaPt_3P$  and can be quickly suppressed by the external pressure, accompanied with decreases in the phonon softening and BCS  $T_c$ . Our results suggest  $SrPt_3P$  as a rare example where superconductivity is enhanced by the CDW fluctuations.

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