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**Enhancing superconductivity of  $A_3C_{60}$  fullerenes : mechanism and its relation to optically stimulated superconductivity** MINJAE KIM, YUSUKE NOMURA, MICHEL FERRERO, CPHT, cole Polytechnique, PRIYANKA SETH, OLIVIER PARCOLLET, IPhT, CEA, ANTOINE GEORGES, Collège de France — Recently, there was a remarkable observation of the nonequilibrium superconductivity (SC) up to  $\sim 100$  K in  $K_3C_{60}$  fullerenes by terahertz (THz) optical pump probe experiment.[Ref.[1]] This temperature (T) of nonequilibrium SC is much higher than  $T_c$  of equilibrium (20K). Motivated by the experiment, we investigate how perturbation effects on SC of  $A_3C_{60}$  by using the strong-coupling model. We have shown that the perturbation such that smaller Coulomb interaction in two of three LUMO of  $C_{60}$  enhances  $T_c$  of fullerenes, potentially up to factor of 1.8. We have shown that this type of perturbation could be realized in the pump probe experiment by  $T_{1u}(4)$  phonon excitation which is suggested to be pumped from the THz light. Other types of perturbations are detrimental to the SC of fullerenes. The mechanism of  $T_c$  of fullerenes is that (i) stabilization of spin-singlet states, and (ii) preservation orbital fluctuation. This finding provides guideline for experiment to observe an enhancement of  $T_c$  and basis for theoretical investigation of nonequilibrium phenomena of fullerenes. [1] M. Mitrano et al., Nature 530, 461 (2016).

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