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Achieving higher T_C superconductivity in dense cuprates, iron selenides, and hydrocarbons[1]

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Pressure plays an essential role in inducing or tuning superconductivity as well as shedding insight on the mechanism of superconductivity. There are much rich phase diagrams in unconventional superconductors under pressure. Finding ways to control the quantum coherence properties to have a higher critical temperature T_C than the material has remains a challenge. Here we will talk about our recent experimental efforts in achieving higher temperature superconductivity in cuprates, iron selenides, and hydrocarbons. We will show how to enhance remarkably T_C through the pressure tuning of competing electronic order in multilayer cuprates [1] and how to have superconductivity in two distinct regimes in iron selenides [2,3]. We will present a discovery of an enhancement of T_C at more than doubled ambient value in a highly compressed aromatic hydrocarbon [4]. Our results have important implications for designing and engineering superconductors with much higher T_Cs at ambient conditions.

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