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Emergence of superconductivity in doped H_2O ice at high pressure JOSE A. FLORES-LIVAS, University of Basel, ANTONIO SANNA, ARKADY DAVYDOV, Max-Planck Institute for Microstructure Physics , STEFAN GOEDECKER, University of Basel, MIGUEL A.L. MARQUES, University of Halle-Wittenberg — We investigate the possibility of achieving high-temperature superconductivity in hydrides under pressure by inducing metallization of otherwise insulating phases through doping, a path previously used to render standard semiconductors superconducting at ambient pressure. Following this idea, we study H_2O, one of the most abundant and well-studied substances, we identify nitrogen as the most likely and promising substitution/dopant. We show that for realistic levels of doping of a few percent, the phase X of ice becomes superconducting with a critical temperature of about 60 K at 150 GPa. In view of the vast number of hydrides that are strongly covalent bonded, but that remain insulating up to rather large pressures, our results open a series of new possibilities in the quest for novel high-temperature superconductors.

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