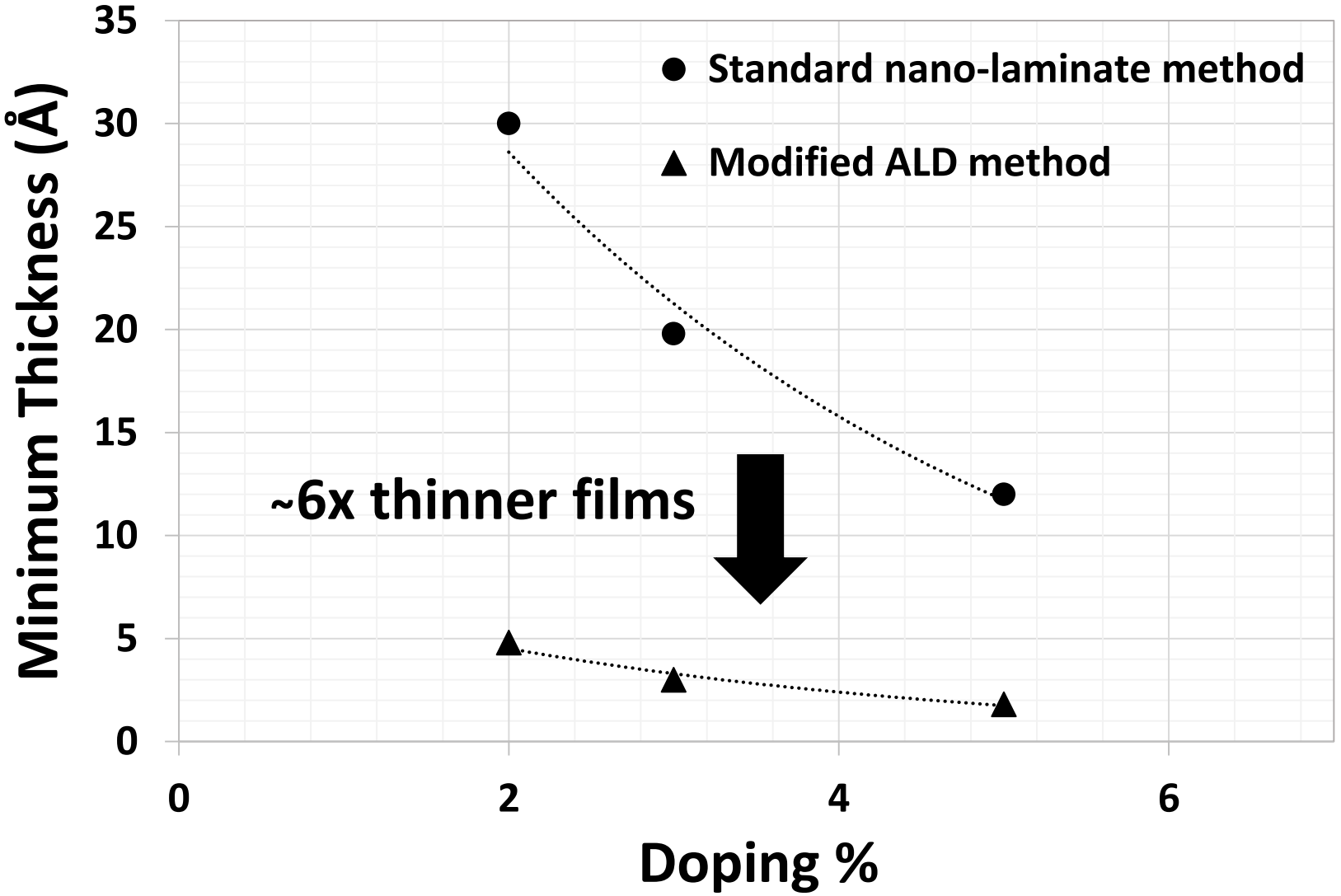

Fig. 1: Minimum thicknesses required to achieve a certain doping percentage using the standard nanolaminate process and the proposed modified ALD process. The calculations for the standard nanolaminate process are based on Zr-doped HfO_2 films using TEMAHf-H_2O and TEMAZr-H_2O ALD processes at 300°C with a growth rate of 0.6Å/cycle for both processes. For example, to achieve a 5% doping the film would need to have a minimum thickness of 19 HfO_2 cycles + 1 ZrO_2 cycle, which equals 12Å. For the modified ALD process such concentration can be obtained using 3 super-cycles, which equals ~1.8Å.