# Practical doping principles

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# Practical doping principles

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with killer defects, or prevent $E_F$ from moving.'' An example is the use of H during Mg doping[12] of GaN: without H, excessive *p*-type Mg doping will lead to the spontaneous formation of $V_N$ once the Fermi energy moves sufficiently towards the VBM. But since H acts as a donor, it prevents the movement of $E_F$ towards the VBM, thus defeats the formation of the $V_N$ killer defect. Subsequently, H is annealed out. This rule suggests, for example, that *p*-type doping of oxides can be facilitated by creating internal oxygen precipitates that eliminate oxygen vacancies, e.g., using NO or $NO_2$ sources[3,5] for nitrogen-doping of ZnO, or using $Li_2O$ sources for Li doping of MgO (Ref. 23).

(ii) *Doping rules pertaining to chemical potential effects.*