Disorder induced transition between $s_{\pm}$ and s_{++} states in two-band superconductors

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We have reexamined the problem of disorder in two-band superconductors, and shown within the framework of the T-matrix approximation that the suppression of T_c can be described by a single parameter depending on the ratio of intra- and interband dimensionless scattering strength. T_c is shown to be more robust against nonmagnetic impurities than would be predicted in the trivial extension of Abrikosov-Gorkov theory. For some realizations of $s_{\pm}$ pairing in such systems, we find that a disorder-induced transition between the $s_{\pm}$ states to a gapless and then to a fully gapped s_{++} state, which occurs at a critical value of the interband scattering rate. We discuss how this transition can manifest itself in the behavior of the electronic density of states and the magnetic field penetration depth.