Caloric determination of the anisotropic phase diagram of BaFe$_2$(As$_{1-x}$P$_x$)$_2$ crystals$^1$ WAI-KWONG KWOK, ULRICH WELP, CARLOS CHAPARRO, LEI FANG, ALEXEI KOSHELEV, Argonne National Laboratory — We report specific heat measurements on a series of BaFe$_2$(As$_{1-x}$P$_x$)$_2$ single crystals with phosphorous contents ranging from optimal doping ($x\sim0.3$, $T_c = 29.5$ K) to highly overdoped ($x\sim0.6$, $T_c = 11$K). We find a sharp superconducting transition at $T_c$ for all doping levels, a suppression of the $\Delta C$-step at $T_c$ with increasing doping and enhanced magnetic field dependence at higher doping. The phase diagrams determined from specific heat data show a decrease of $dH_{c2}/dT$ with increasing doping and a nearly constant superconducting anisotropy of $\Gamma \sim 2.5$. Our results will be compared with the proposed “universal” scaling of $\Delta C_p/T_c$ and $dH_{c2}/dT$ due to quantum criticality and non Fermi liquid behavior [1] and due to strong pair-breaking and non-magnetic interband scattering [2], respectively.


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