Uniaxial pressure dependence of the magnetic ordered moment and transition temperatures in BaFe$_{2-x}$Ni$_x$As$_2$

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We use neutron diffraction and muon spin relaxation to study the effect of in-plane uniaxial pressure on the antiferromagnetic phase in BaFe$_2$As$_2$ and superconducting BaFe$_{1.915}$Ni$_{0.085}$As$_2$. We find that the ordering temperature (TN) increases in both compounds, consistent with calculations of the static spin susceptibility within the random-phase approximation. At low temperature, where uniaxial pressure mechanically detwins the crystals, we find that the magnetic ordered moment in BaFe$_{1.915}$Ni$_{0.085}$As$_2$ increases by as much as 20% under 40 MPa of pressure, whereas no change was observed in BaFe$_2$As$_2$. The doping and uniaxial pressure dependence of the magnetic ordered moment is captured by DFT+DMFT calculations which suggests the pressure-induced increase near superconductivity is closely related to the diverging nematic susceptibility. We will also present new spin wave data on fully detwinned BaFe$_2$As$_2$.