Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Intercallation of $Li_{1-x}Fe_xO_2$ in the superconducting FeSe DESPINA LOUCA, JUNJIE YANG, University of Virginia — The intercallation of $LiFeO_2$ in the tetragonal lattice of the 8 K superconductor $Fe_{1-y}Se$ leads to a great enhancement of the superconducting transition temperature, $T_C \sim 43$ K, and to an antiferromagnetic transition at 8.5 K. While the $LiFeO_2$ layer acts as a charge reservoir, its Fe^{3+} ion ($3d^5$) is magnetic creating a magnetic buffer layer. Most recently, we developed a new synthesis method to control the Fe concentration in the intercallating layer as well as the filling ratio of the $Li_{1-x}Fe_xO_2$: FeSe layers. Neutron scattering measurements were carried out on powder samples of $(Li_{1-x}Fe_xO_2)_yFeSe$. With the intercallation, no crystal structural transition from the P4/nmm symmetry occurs but the c-axis lattice constant expands substantially, evidence of the intercallation. At the same time, the tetrahedral FeSe layers remain intact with no compression or expansion and free of vacancies. Moreover, the intercallation along the c-axis although not uniform leads to a reduction in T_C when the ratio of $Li_1 - xFe_xO_2$: FeSe layers is about 1 to 3. Our results also indicate that the amount of Fe in the $Li_1 - xFe_xO_2$ layer has a direct correlation to the transition temperature as well.

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Date submitted: 04 Nov 2015 Electronic form version 1.4