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Fabrication and physical characterization of electrochemically deposited FeSe

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A superconducting critical temperature, Tc, increasing from 8 K to 37 K under an applied external pressure, has been recently reported in iron selenide (FeSe) compounds [1]. Iron-based superconductors are particularly appealing for high magnetic field applications thanks to their promising superconducting properties (i. e. , extremely high upper critical field and irreversibility field). Based on recent progresses in fabricating FeSe superconducting films [3], we successfully electrodeposited FeSe films with a standard three-electrode method. In the presented electrochemical approach, the film has been deposited onto a Cu thin layer at -1V vs. Ag/AgCl in an inert gas saturated solution with a Pt counter electrode at room temperature. The solution employed has been achieved by dissolving 0.03 M FeCl2 4H2O, 0.015 M SeO2 and 0.1 M Na2SO4 into distilled water. The mole ratio of Fe and Se has been controlled by carefully tuning both the electric potential (1V) and pH value (~2). In order to infer the desired crystal structure and morphology of the deposited films, the samples have been analyzed by X-ray diffraction (XRD) and scanning electron microscopy (SEM) techniques. The onset of the superconductive transition together with its critical parameters (Tc, Jc) has been measured by both standard four-probe technique and magnetization measurements as a function of the temperature and external magnetic field.

References:

[1] S. Medvedev et al., Nat. Mat. 8, 630, 2009
[2] W. Si et al., Nat. Commun. 4, 1347, 2013
[3] S. Demura et al., Sol. State Commun. 154, 40, 2013

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