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New strategies in PLD growth of iron-oxypnictides

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Pulsed laser deposition (PLD) in thin film growth of iron oxypnictides (ZrCuSiAs-type structure) faces several difficulties. Recently, further advances were made in the *in-situ* deposition of fluorine-doped oxypnictide films using fluorine diffusion from the substrate [1,2] or in hydrogen-doping based on an *ex-situ* diffusion process and a topotactic reaction [3]. Here we present a new strategy in the deposition of iron oxypnictides based on an iron pnictide template ($BaFe_2As_2$). This approach does not only allow a reduction of lattice mismatch between film and substrate but also offers a compatible chemical bonding environment at the interface resulting in a common FeAs-layer. For the purpose of investigating how superconductivity is affected by this specific template approach we turned to Co-doped iron oxypnictides ($SmOFe_{1-x}Co_xAs$ and $LaOFe_{1-x}Co_xAs$). Our analysis combines structural and analytic investigations using XRD, TEM, electrical transport measurements and AES depth profiling. We will finally discuss the role of diffusion processes in iron oxypnictides in comparison with previous results on F-doped thin films with a diffusion-gradient hybrid structure [4]. The results demonstrate how diffusion affects the superconducting state of individual iron-pnictide layers.

References
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