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Pulsed laser deposition of functional oxides - towards a transparent electronics

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Metal oxides, in particular with transition metals, show strong electronic correlations which determine a huge variety of electronic properties, together with other functionalities. For example, ZnO and Ga2O3 as wide-bandgap semiconductors have a high application potential as transparent functional layers in future oxide electronics [1-2]. Other oxides of current interest are ferrimagnetic spinels of the type MFe2O4 (M=Zn,Co,Ni), see K. Brachwitz et al. Appl. Phys. Lett. 102, 172104 (2013), or highly correlated iridate films, see M. Jenderka et al. Phys. Rev. B 88, 045111 (2013). Furthermore, combinations of ferroelectric and magnetic oxides in multiferroic composites and multilayers show promising magnetoelectric coupling. For the exploratory growth of the above mentioned novel oxides into nm-thin films, pulsed laser deposition (PLD) appears as the method of choice because of its extremely high flexibility in terms of material and growth conditions, high growth rate and excellent structural properties [3]. This talk highlights recent developments of new functional oxides using unique large-area PLD processes running for more than two decades in the lab of the author [3].

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