

## Do we understand magnetic properties of ZnMnO?

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ZnMnO is presently intensively studied for spintronics applications as a possible room temperature ferromagnetic material (RT FM). However, it is now believed that RT FM reported by some of the groups is due to inclusions of various Mn oxides and to metal accumulations and not to volume properties of ZnMnO alloys. Such inclusions and accumulations are present in most of ZnMnO films grown with high temperature methods, giving a dominant magnetic response of the ZnMnO samples. Our recent investigations indicate that LT growth is the most promising way to avoid formation of foreign phase inclusions of  $Mn_xO_y$  in ZnMnO and to block a spinodal decomposition [1-3]. The LT growth enables to obtain material with controlled magnetic properties, as reported by us [1-3].

In this presentation we shortly discuss growth conditions of ZnMnO with the required structural and magnetic properties. We show that LT ALD films of ZnMnO, those with low Mn fractions, are practically inclusions free and show homogeneous Mn distribution. Magnetic and magneto-optical properties of these LT ZnMnO films are discussed based on the results of SQUID, photoluminescence (PL), cathodoluminescence (CL), magneto-PL and ESR investigations. PL and CL of ZnMnO is observed only for samples with low Mn fractions and emission intensity drops rapidly with increasing Mn content indicating that Mn acts as emission deactivator in ZnO. In the samples with increased Mn content PL/CL becomes in-plane inhomogeneous. LT ZnMnO films grown with low Mn fractions (below 5 %) are paramagnetic at RT and show some contribution to Mn-Mn anti-ferromagnetic interactions at LT.

### References:

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