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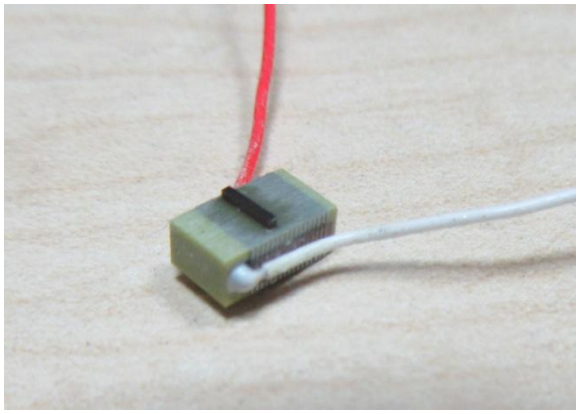
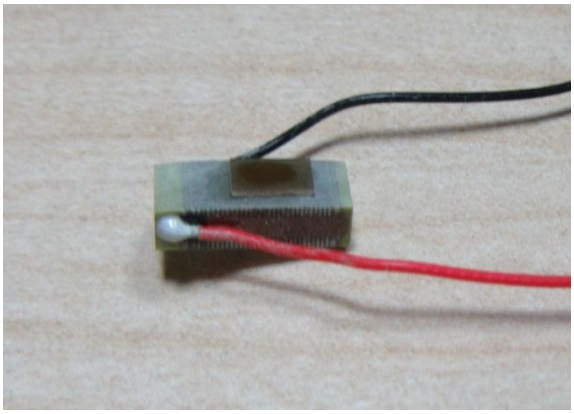
In the (Ga,Mn)N-based piezoelectric system a voltage V applied across the crystal strains it linearly. This in turn deforms the crystal field which surrounds the magnetic ions and so modifies their ground state, e.g. magnetic anisotropy. In this particular case (Ga,Mn)N layer acts both as piezoelectric and magnetic material. However, GaN-related structures grown on sapphire substrates exhibit a prohibitive large density of threading dislocations (TD), which will preclude direct electrical gating. The under-gate dielectric oxide layer has to be additionally deposited by atomic layer deposition (ALD) method to block the short-circuiting current which would flow through TD. Only small structures of the area A smaller that $1mm^2$ can be fabricated as the breakdown voltage is usually inversely proportional to A^2. However it is also possible to cement magnetic (Ga,Mn)N samples to a piezoelectric stressor. In this way, we get rid of the problem of short-circuiting current, and we can fabricate structures with high A, suitable for direct magnetic measurements.





During mobility time I visited the School of Physics & Astronomy at the University of Nottingham, UK. I have successfully realized the main goal of my visit, namely that I have learnt how to cement magnetic samples to a piezoelectric stressors. Two different GaMnN samples (mechanically polished to a thickness of about few hundreds μm) have been used. a) Bulk samples with small manganese concentration grown by HVPE method. b) MBE grown samples, with high manganese concentration and c-axis along the growth direction. Together with the researchers from UK, we have discussed the details of the experimental procedure, performed experiments as well as assessed and analysed the results. The working devices, (Ga,Mn)N samples bonded to piezoelectric stressors (shown in the figures), were taken back to Warsaw, Poland. Additionally, I gave a presentation of recent results concerning magneto-electric effects in ferromagnetic (Ga,Mn)N layers.

Expected outcomes and impact:

The main value of the mobility was the exchange of knowledge and experience in the area of piezoelectric elements.

It is expected, that the obtained results will form the basis for at least one new publication.