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Noise in Half-Metallic Ferromagnetic Thin Films SIDDHARTHA GHOSH, KARL HULTQUIST, SUBHRANGSHU MALLIK, University of Illinois at Chicago, GUOXING MIAO, ARUNAVA GUPTA, University of Alabama — Half metallic oxides are one of the most potential materials for the spintronics application, such as tunnel magnetoresistance. Among different half-metals CrO_2 is the only binary oxide that is ferromagnetic metal and shows almost 100% spin polarization at the Fermi level. However, CrO_2 films have higher low frequency noise, which is an order of magnitude more than the metal film noise. This phenomenon restricts these films for applications such as integrated spin based sensor. We have measured the low frequency flicker ($1/f$) noise for CrO_2 film grown on TiO_2 substrate grown by CVD over different temperature and bias range. Our aim is to understand and relate the low frequency noise to grain boundaries, defects etc. Bias and temperature were varied during measurements. The noise is almost constant over the “zero-current” region of the current-voltage characteristics. At an elevated temperature the width of the “zero-current” region decreases and as a consequence the current increases for the same bias. Increase in noise level is observed with increase in sample temperature. The same increase in noise level is observed when we increase the sample volume for a particular temperature and bias. As expected the noise level is higher than in metal metal films. In our results we can clearly see the effect of the temperature and the size for the CrO_2 film.

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