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Ultra-sensitive Hall sensors based on graphene boron nitride heterostructures JAN DAUBER, JARA-FIT and II. Institute of Physics, RWTH Aachen University, Aachen, Germany, ABHAY A. SAGADE, Advanced Microelectronic Center Aachen (AMICA), AMO GmbH, Aachen, Germany, MARTIN OELLERS, JARA-FIT and II. Institute of Physics, RWTH Aachen University, Aachen, Germany, KENJI WATANABE, TAKASHI TANIGUCHI, National Institute for Materials Science, 1-1 Namiki, Tsukuba, Japan, DANIEL NEUMAIER, Advanced Microelectronic Center Aachen (AMICA), AMO GmbH, Germany, CHRISTOPH STAMPFER, JARA-FIT and II. Institute of Physics, RWTH Aachen University, Aachen, Germany — Recent developments of encapsulating graphene in hexagonal boron nitride lead to well protected graphene with very high material quality. This opens interesting possibilities for applications, such as graphene-based Hall sensors. Magnetic field sensors using Hall effect are widely used in different fields of applications, e.g. automotive and consumer electronics. Their performance benefits greatly from high room temperature mobility and low charge carrier density, which makes graphene boron nitride heterostructures a promising material for these devices. Here, we present the fabrication and characterization of Hall sensor elements based on graphene boron nitride heterostructures. We show a detailed characterization including Hall effect measurements under ambient and vacuum conditions. We achieve current- and voltage-related sensitivity up to 5700 V/AT and 3V/VT, respectively, outpacing state-of-the-art silicon and III/V Hall sensor devices. Finally, we determine a magnetic resolution limited by low frequency electric noise less than 0.5 mG/?Hz.

Jan Dauber
JARA-FIT and II. Institute of Physics, RWTH Aachen University,
52074 Aachen, Germany

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