Graphene-Based Sensors of NO$_2$, H$_2$, Acetone, and other Gases/Vapors: State of the Art and Realistic Outlook

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Abstract. The paper reviews the state of the art of graphene employed as an active layer in chemiresistive gas sensors. Graphene properties such as high specific surface area, low noise, planar structure, flexibility, etc., are commonly highlighted as strengths in the sensors technology. However, the listed virtues are mostly related to the pristine graphene or even graphene monolayers, while majority of devices use chemically synthesized graphene derivatives. These vague statements may be induced by the high level of graphene hype and racing for the research grants. Moreover, graphene has no dangling bonds functioning as prime reaction agents. This led us to propose more adequate view onto a capacity of graphene in the area of gas sensors. In this study, we focused onto three aspects: (i) the substantiation of the low noise for sensing devices, (ii) the assumed versus actual surface area of the real graphene layers, and (iii) an integration of graphene sensors into silicon circuits.