Pillared reduced graphene oxide with Mg in the interlayer space as hydrogen storage material

Feng Yan,[1]
Estela Moretón Alfonsín,[1] Konstantinos Spyrou,[2,3] Dimitrios Gournis[3] and Petra Rudolf[1]

[1]*Zernike Institute for Advanced Materials, University of Groningen, Nijenborgh 4, 9747AG Groningen, The Netherlands*
[2]*Department of Materials Science and Engineering, Cornell University, 310 Bard Hall, Ithaca, NY 14853-1501, U.S.A.*
[3]*Department of Materials Science & Engineering, University of Ioannina, P.O. Box 1186, 45110 Ioannina, Greece*

f.yan@rug.nl

Hydrogen is a promising sustainable alternative to conventional fuels that can push forward the energy transition. The caveat of this technology is the storage, since gravimetric and volumetric density targets have proven hard to reach. Theoretical studies of the gravimetric densities on graphene and in magnesium predict 8.3 wt% and 7.6 wt%, respectively. However, these values are still far from reality because of the weak physisorption and high chemisorption temperature. Herein, a novel pillared reduced graphene oxide with Mg in the interlayer space is proposed for effective hydrogen storage. The material, realized by sol-gel reaction of an organosilicon precursor, was characterized with BET, SEM, XPS, XRD and TEM and shows a crosslinked mesoporous structure with high specific surface area, narrow interlayer distance and enhanced adsorption due to the alkaline hydrides.