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Exfoliation and Dispersion of 2-Dimensional Materials by Elevating Temperature[1] SANGHYUK KWON, School of Mechanical Engineering, Sungkyunkwan University, 2066 Seobu-ro, Jangan-gu, Suwon 440-746, Korea, JINSEON KIM, Mechanical Test Analysis Section, Korea Electric Power Corporation Nuclear Fuel, Daedeok-daero 989 beon-gil, Youseong-gu, Daejeon 305-353, Korea, HYUKJOON KWON, SKKU Advanced Institute of Nanotechnology, Sungkyunkwan University, 2066 Seobu-ro, angan-gu, Suwon 440-746, Korea, CHANGGU LEE, School of Mechanical Engineering, Sungkyunkwan University, 2066 Seobu-ro, Jangan-gu, Suwon 440-746, Korea, GRAPHENE ENGNEERING LAB TEAM — It is known that graphene and other 2-dimensional materials are hard to dissolve in water without using chemicals or surfactants. Here, we present a facile method to exfoliate and disperse those materials in water by simply controlling temperature. Graphene, when sonicated in water at high temperature (60C), was edge-functionalized due to the extremely high temperature and pressure locally induced by ultrasonic cavitation, and dissolved in water stably even for longer than 1 month. However, it was not dispersed at low temperature(30C) because of less cavitation and reduced sonochemical reaction. Other 2-dimensional materials, such as h-BN, MoS2, and other layered metal chalcogenides, were also well dissolved in water as graphene, but even at low temperature. Their stable solution is from the electric double layer because their relatively high insulating property. Also elevated storage temperature (60C) improved the long-term dispersion stability compared to lower storage temperature (20C)

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Sanghyuk Kwon
School ofMechanical Engineering, Sungkyunkwan University, 2066 Seobu-ro, Jangan-gu, Suwon 440-746, Korea

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