Retrieval of a Gas of Interest from Its Storage Materials by Resonant Infrared Radiation

Disclosure Number

200601747

Technology Summary

This invention uses a new technique of resonant infrared photodesorption as a means of evolving a gas of interest from its storage materials for multiple purposes. For example, hydrogen adatoms on the vast internal surface area of nanocrystal diamonds may be radiated by an infrared laser whose photon energy is resonant with the adsorbate-substrate vibrational stretch mode, leading to non-thermal, non-electronic desorption of hydrogen. Hydrogen gas is thus efficiently formed and released from this storage material for end uses, such as energy generation through chemical reaction with oxygen. This process of retrieving hydrogen takes place at room temperature and at near atmospheric pressures, avoiding the conventional problem of heat dissipation at extreme temperatures and pressures, thus enhancing the safety of the system. The proposed storage materials are transparent to infrared radiation, which not only allows infrared laser to effectively reach hydrogen adatoms on the entire internal surface area, but also eliminates the adverse electronic excitation in the bulk of storage materials. The rate of evolving hydrogen can be easily controlled by varying the intensity of infrared radiation. When implemented, this invention will have a colossal impact to the technology of retrieving a gas of interest, e.g., hydrogen, from its storage materials, thus reshaping the whole hydrogen economy and the energy structure of our society. As of this time, resonant infrared photodesorption of hydrogen from silicon and diamond surfaces has been demonstrated in our laboratory at Vanderbilt University.

Inventor

ZHANG, ZHENYU

Materials Science and Technology Div

Licensing Contact

DETRANA, ALEXANDER G
UT-Battelle, LLC
Oak Ridge National Laboratory
Rm 139, Bldg 4500N, MS: 6196
1 Bethel Valley Road
Oak Ridge, TN 37831

Office Phone: (865) 576-9682
E-mail: DETRANAAG@ORNL.GOV