

1. Please explain why putting backing soda into hot water (95°C) produces a lot of gas?

2. Please explain why a flask with glass stopper (usually from pyrex or quartz) cannot be opened after a few weeks of a concentrated solution (>15%) of NaOH or KOH. Please think about other substances that can cause the same results.



3. On 12 August 2015, a series of explosions killed over 170 people and injured hundreds of others at a container storage station at the Port of Tianjin. The firemen were informed of a fire in a warehouse containing polyethylene. Therefore, they had started using water to extinguish the fire. However, the adjacent warehouse contained CaC_2 . This information was not passed to the fireman. After some time, the neighboring warehouse exploded with a force that sent its roof a few hundred meters away and caused the next neighboring warehouse containing ammonia nitrate (hundreds of tons of it) to blow up. Please explain what had happened in the warehouse containing CaC_2 from the chemical physical point of view. Think what would have happened if instead of CaC_2 the warehouse contained CaH_2 ?

4. Please explain why most containers for hydrogen storage have anodized (or some other coating) on the inside. Please think what would happen if a steel or aluminum container with hydrogen has its coating damaged. Please think why stainless steel, Al and Ti (as well as Ta, Zr) are relatively stable with respect to H_2 .