

COMPILATION: Hoffman apparatus: electrolysis of water

Date: 18 Jan 2017

From: Barbara Besal

I'm performing the electrolysis of water using a Hoffman apparatus in class. Has anyone ever tried this and NOT gotten a 2:1 ratio? Today, I ran the demo for about 30 minutes in class and was very dismayed to find that the two volumes of gas were nearly identical. I can't figure out what is causing this. I could understand if maybe there was a greater than 2:1 ratio (perhaps because some of the oxygen was dissolving into the water), but I cannot explain a ratio smaller than 2:1. I'm using sodium sulfate as the electrolyte. The power source is set to 25V. I don't think the sulfate ion should be oxidizing along with the oxygen. I can understand and appreciate that the solution may not be Faradaic ideal, but it shouldn't be THAT far off, should it? Any thoughts or suggestions are appreciated!

From: Scott Milam

I've tried using various solutions and have found 3M NaOH to work very well to get the 2:1 ratio. Other chemicals have given inconsistent results where other gases are produced (some being soluble in water). Lowering the voltage might also help and if all else fails, there are videos of it; mine is at
www.youtube.com/watch?v=vFR9zUGt2C4

Date: Thu, 19 Jan 2017

From: Barbara Besal

Thanks to everyone who replied to my plea for help! Just wanted to report back the results. The best solution I tried was to replace the sodium sulfate electrolyte with 1M NaOH. I got a consistent ratio much closer to 2:1 (it came out to ~2.2:1, but I can work with that!). The electrolysis itself actually went much faster and appeared clearer with the NaOH, too. The Na₂SO₄ tended to foam and be a little cloudy. I appreciate your help!

[Other posts, for future benefit to others.]

- 1) Are you sure that your power supply is DC (e.g. a battery) and not AC?
- 2) We have done this experiment in Physical Science for years and we have use a saturated sodium carbonate solution that works very well and gives a consistant 2:1 ratio.