Solution to standard hydrogen electrode challenge

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Solution

Although the standard hydrogen electrode is never used in practice today, it is the standard against which all other standard electrode potentials are referenced. Surprisingly, even though a drawing of the standard hydrogen electrode appears in most introductory textbooks on analytical chemistry, very few of the electrodes would work in practice.

The answer why none of the depicted electrodes (Figs. 1, 2, 3) would work in practice is really quite simple. In all three figures the electrolyte level would uncover the upper half of the electrode (only correctly illustrated in Fig. 2) but the hydrogen gas would not reach the lower half. The only way in which a hydrogen electrode can work in practice is for the hydrogen gas to be introduced through a tube having its orifice below the lowest point of the electrode so that fine bubbles of hydrogen pass over its surface, as shown in Fig. 4.

Fig. 1 Standard hydrogen electrode depicted in Fig. 9-1 in [1]

Fig. 2 Standard hydrogen electrode depicted in Fig. 10.4 in [2]
Fig. 3 Standard hydrogen electrode depicted in Fig. 15.4 in [3]

Fig. 4 Galvanic cell with a standard hydrogen electrode half cell (right)

References

