HACH-LANGE Elektrochemie
mV potentials of common ORP standard solutions

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Introduction

ORP electrodes consist of a reference element (usually Ag/AgCl), an electrolyte solution (usually 3 M KCl) and a metal indicating electrode While the reference element should remain stable at a certain mV potential, the liquid junction (diaphragm) and metal electrode can change their behaviour over time. Sample solution can dramatically change the metal surface or block the liquid junction causing a variation of the ORP electrode potential.
In order to get the actual condition of the ORP electrode, an ORP standard solution is used to evaluate the performance of an ORP electrode. The probe is placed in an ORP standard solution and after temperature stabilization the mV reading can be taken. Comparing the actual mV reading with the defined mV potential of the standard gives the mV OFFSET.
A variation of more than ±50 mV indicates the need for cleaning, conditioning or replacement of the ORP probe. If the offset is within the accepted mV range, the ORP readings of the samples must be corrected by this offset.
Most ORP standards are defined for temperature of 20 or 25°C, but not over the range of 0 to 50 °C. This article describes the measurement results of several ORP standards by using 4 new individual ORP probes.

Experimental setup

In a thermostated water bath (with heating and cooling device) the ORP standard solutions are set to the temperature °C, while medium stirring and ORP probes were placed in the solution. So the whole system was brought to the same temperature. Both, mV potential and temperature were recorded 3 times.

Table 1 shows the final data for 4 different ORP standard solutions:

mV potential of ORP standards vs. temperature	Part number			
	25M2A1001-115	25M2A1002-115	Norm recipe *)	C10G100
Temperature °C	Potentials of **"200mV"** ORP standard ±3 mV	Potentials of **"600mV"** ORP standard ±3 mV	Potentials of **Light's ORP** solution ±3 mV	Potentials of **C10G100** mV ORP ±3 mV
0	242	574	442	286
5	234	579	447	279
10	225	585	452	273
15	217	590	458	266
20	208	595	464	260
25	200	599	470	253
30	192	604	477	247
35	183	609	484	241
40	175	613	492	234
50	157	621	509	221

*) 1,861g Fe(NH4)2(SO4)2*6aq + 2,411g FeNH4(SO4)2*12aq in 500 ml 1M H2SO4, -> 476 mV at 25°C

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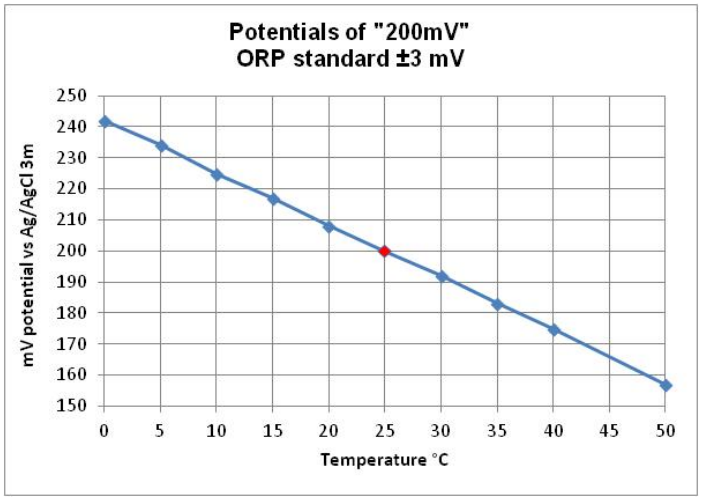
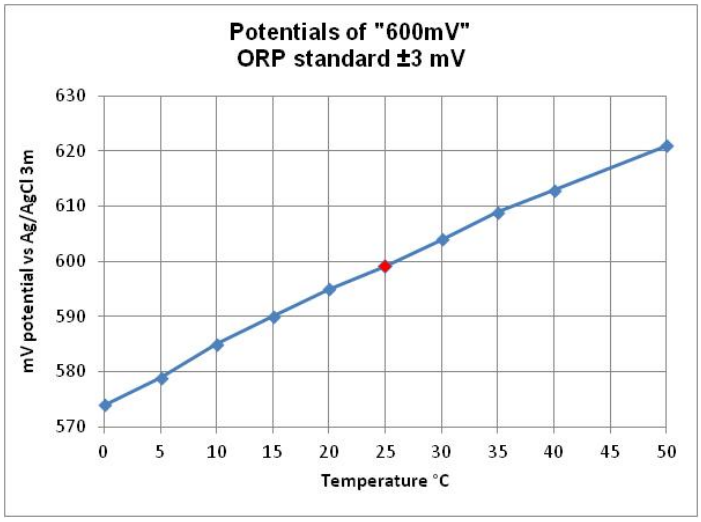
Graph 1: mV / °C curve for the 200 mV ORP standard



Graph 2: mV / °C curve for the 600 mV ORP standard



Graph 3: mV / °C curve for the 252 mV ORP standard