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Letter to the editor

Sodium peroxydisulfate is a stable and cheap substitute for ammonium peroxydisulfate (persulfate[1]) in polyacrylamide gel electrophoresis

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The current literature for the preparation of polyacrylamide gels using peroxydisulfate invariably specifies the use of 10% solutions of the ammonium salt. The ammonium salt is unstable in the solid state; it is expensive; and it acts as a buffer. We recommend the sodium salt.

Three salts of the peroxydisulfate ion are commercially available: ammonium, sodium, and potassium. The sodium and potassium salts are stable in the solid state at room temperature, but the ammonium salt, if not absolutely dry, slowly decomposes. Because of this instability, it is common practice to buy the ammonium salt in small lots at a cost of about \$1/g. The sodium and potassium salts, if bought in pound lots, cost 3–5 cents/g. In the early days of gel electrophoresis, potassium peroxydisulfate was also used. Indeed, Chrambach [1] recommends its use in order to avoid buffering by the ammonia system. He makes no mention of the sodium salt or of the instability of the ammonium salt. Another factor which concerns gel makers is solubility as it is usual to add ammonium peroxydisulfate from a 10% stock solution (0.44*M*). Balej and Regner have carefully determined these solubilities in a series of papers [2–4]. The ammonium salt is the most soluble of the three salts, but the sodium salt is almost as soluble. At 20°C, saturated solutions are 2.5 *M* (ammonium), 2.3 *M* (sodium), and 0.17 *M* (potassium).

The instability of the ammonium salt has been known for about 100 years. It is due to the oxidation of the ammonium ion and of ammonia by peroxydisulfate. The products are N_2, NO_2^-, and NO_3^- [5]. Of course, even the sodium and potassium salts decompose in solution, but the half-time for this process is about 1 year at 25°C.[2] A review of the thermal decomposition of peroxydisulfate is available [6].

We have compared the behavior of pre-mixed high-range protein markers (Boehringer Mannheim; 200, 116, 97, 66, and 39 kDa) on 15, 12, 10, & 7.5% polyacrylamide gels prepared as usual but using equimolar amounts of either ammonium or sodium

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[1]We urge that the term 'persulfate' be abandoned as this usage does not distinguish between peroxydisulfate and peroxymonosulfate.

[2]Chrambach [1] states that solutions of potassium peroxydisulfate do not keep longer than a week at 4°C but we have seen no change in gels using solutions of the sodium salt kept at this temperature for more than three months. This is consistent with the calculated half-life of about 80 years for peroxydisulfate at this temperature [6].

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peroxydisulfate, final concentration 2×10^{-3} *M*. The gels were cast on a Mighty Small II mini-vertical two gel apparatus (Hoefer Scientific), run back-to-back at 100 V, stained, and destained. We could detect no differences in the appearance of the corresponding pairs of gels.

Sodium peroxydisulfate has clear advantages over both the potassium and the ammonium salts (particularly the latter) for the preparation of polyacrylamide gels; it is much more soluble than the former allowing preparation of 10% stock solutions and stable in the solid state unlike the latter.

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References

[1] A. Chrambach, The Practice of Quantitative Gel Electrophoresis, VCH, Weinheim, 1985, pp. 64 and 75.
[2] J. Balej, A. Regner, Coll. Czech. Chem. Commun. 25 (1960) 1685.
[3] J. Balej, A. Regner, Coll. Czech. Chem. Commun. 28 (1963) 254.
[4] J. Balej, A. Regner, Coll. Czech. Chem. Commun. 31 (1966) 361.
[5] R.E. Ball, A. Chako, J.O. Edwards, G. Levey, Inorg. Chim. Acta 99 (1985) 49.
[6] E.J. Behrman, J.O. Edwards, Rev. Inorg. Chem. 2 (1980) 179.