different from the cation of the active metal in the electrolyte should be at most 30 mol%, values of at most 20 mol%, 10 mol%, 5 mol% and 1 mol% being further preferred in this order.

With respect to the molar relation of conductive salt and sulfur dioxide, it is preferred that the electrolyte contains at least 1 mole of $SO_2$ per mole of conductive salt, with values of 2, 3, 4 and 6 moles of $SO_2$ per mole of conductive salt being further preferred in this order. Very high molar fractions of $SO_2$ are possible. The preferred upper limit can be specified as 50 moles of $SO_2$ per mole of conductive salt and upper limits of 25 and 10 moles of $SO_2$ per mole of conductive salt are further preferred in this order.

In accordance with a first aspect of the present invention, there is provided an electrolyte for an electrochemical battery cell, containing sulfur dioxide and a conductive salt, characterized in that the molar concentration of hydroxide groups in the electrolyte is at most 50 mmol per liter, and that the molar concentration of chlorosulfonate groups in the electrolyte is at most 350 mmol per liter.

In some embodiments, the molar concentration of hydroxide groups in the electrolyte is at most 45 mmol per liter, preferably at most 25 mmol per liter, further preferably at most 15 mmol per liter and particularly preferably at most 5 mmol per liter.

In some embodiments, the molar concentration of chlorosulfonate groups in the electrolyte is at most 250 mmol per liter, preferably at most 200 mmol per liter and particularly preferably at most 100 mmol per liter.

In some embodiments, the electrolyte contains at least 1 mol $SO_2$, preferably at least 2 mol $SO_2$, further preferably at least 3 mol $SO_2$, even further preferably at least 4 mol $SO_2$ and particularly preferably at least 6 mol $SO_2$ per mole of conductive salt.

In some embodiments, the conductive salt is a Lewis acid/Lewis base adduct and the electrolyte contains free Lewis base.

In some embodiments, the conductive salt is an aluminate, halogenide, oxalate, borate, phosphate, arsenate or gallate of an alkali metal, preferably of lithium.

In some embodiments, the conductive salt is a lithiumtetrahalogenoaluminate, preferably lithiumtetrachloroaluminate.

In some embodiments, the electrolyte as described herein contains, relative to the mole number of all salts dissolved in the electrolyte, at most 30 mol%, preferably at most 20 mol%, further preferably at most 10 mol% and particularly preferably at most 1 mol% of dissolved salt having a cation differing from the cation of the active metal.

In accordance with a second aspect of the present invention, there is provided an electrochemical battery cell containing an electrolyte as described herein, a positive electrode and a negative electrode.

In some embodiments, the active metal is an alkali metal, an alkaline earth metal or a metal of group 12 of the periodic table or aluminum.

In some embodiments, the active metal is lithium, sodium, calcium, zinc or aluminum.

In some embodiments, the negative electrode is an insertion electrode.

In some embodiments, the negative electrode contains carbon.

In some embodiments, the positive electrode contains a metal compound, preferably a metal oxide or a metal halogenide or a metal phosphate, said metal preferably being a transition metal of the atomic numbers 22 to 28, in particular cobalt, nickel, manganese or iron.

In some embodiments, the positive electrode contains an intercalation compound.

In some embodiments, the positive electrode contains lithium iron phosphate.

In accordance with a third aspect of the present invention, there is provided a process for producing an electrolyte as described herein for an electrochemical battery cell, wherein a Lewis acid base and aluminum are mixed, and the mixture is heated for a minimum period of 6 hours to a temperature above a minimum temperature, the minimum temperature being at least 200 °C and being above the melting point of the mixture, whereby an adduct of the Lewis acid and the Lewis base is formed.

In some embodiments, the minimum temperature is 250 °C, preferably 300 °C, further preferably 350 °C, further preferably 400 °C, further preferably 450 °C and particularly preferably 500 °C.

In some embodiments, the minimum period is 12 hours, preferably 18 hours, further preferably 24 hours, further preferably 48 hours and particularly preferably 72 hours.

In some embodiments, the mixture contains at least 40 mmol, preferably at least 200 mmol and particularly preferably at least 400 mmol of aluminum for each mole of Lewis acid.

As explained above, the electrolyte according to the invention is preferably essentially free of organic materials. However, this does not exclude some embodiments of the invention also containing organic materials in the electrolyte, such as one or a plurality of organic co-solvents. In such an embodiment, however, the overall quantity of the organic material in the electrolyte should in any case be less than 50 wt.%, with values of less than 40, 30, 20, 15, 10, 5, 1 and 0.5 wt.%, relative to the total weight of the electrolyte, being further preferred in this order. According to a further preferred embodiment, the organic material has a flash point of less than

200 °C, with values of 150, 100, 50, 25 and 10 °C being further preferred in this order.

According to a further preferred embodiment, the electrolyte contains two or more organic materials, the organic materials having an average (calculated from the weight ratio) flash point of less than 200 °C, values of 150, 100, 50, 25 and 10 °C being further preferred in this order.

A process suitable for production of an electrolyte according to the invention is characterized by the following steps:

14. Battery cell according to any one of the preceding claims, characterized in that the positive electrode contains a metal compound, preferably a metal oxide or a metal halogenide or a metal phosphate, said metal preferably being a transition metal of the atomic numbers 22 to 28, in particular cobalt, nickel, manganese or iron.

15. Battery cell according to claim 14, characterized in that the positive electrode contains an intercalation compound.

16. Battery cell according to claim 15, characterized in that the positive electrode contains lithium iron phosphate.

17. Process for producing an electrolyte according to one of claims 1 to 8 for an electrochemical battery cell, wherein
a Lewis acid, a Lewis base and aluminum are mixed, and
the mixture is heated for a minimum period of 6 hours to a temperature above a minimum temperature, the minimum temperature being at least 200 °C and being above the melting point of the mixture, whereby an adduct of the Lewis acid and the Lewis base is formed.

18. Process according to claim 17, characterized in that the minimum temperature is 250 °C, preferably 300 °C, further preferably 350 °C, further preferably 400 °C, further preferably 450 °C and particularly preferably 500 °C.

19. Process according to any one of claims 17 or 18, characterized in that the minimum period is 12 hours, preferably 18 hours, further preferably 24 hours, further preferably 48 hours and particularly preferably 72 hours.

20. Process according to any one of claims 17 to 19, characterized in that the mixture contains at least 40 mmol, preferably at least 200 mmol and particularly preferably at least 400 mmol of aluminum for each mole of Lewis acid.