Accepted Manuscript

Title: Chloromethyl pivalate based electrolyte for non-aqueous lithium oxygen batteries

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PII: S1001-8417(17)30362-5
DOI: http://dx.doi.org/10.1016/j.cclet.2017.09.021
Reference: CCLET 4227

To appear in: *Chinese Chemical Letters*

Received date: 12-6-2017
Revised date: 22-7-2017
Accepted date: 5-9-2017

Please cite this article as: Taoran Li, Chaolumen Wu, Huanhuan Yuan, Lei Li, Jun Yang, Chloromethyl pivalate based electrolyte for non-aqueous lithium oxygen batteries, Chinese Chemical Lettershttp://dx.doi.org/10.1016/j.cclet.2017.09.021

Communication

Chloromethyl pivalate based electrolyte for non-aqueous lithium oxygen batteries

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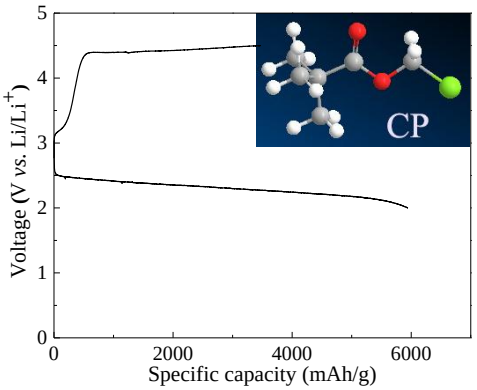
Graphical Abstract



A novel stable liquid electrolyte with chloromethyl pivalate used as solvent for Li-O_2 batteries was first reported, and the batteries showed high specific capacity and good cycling stability.

ARTICLE INFO

Article history:
Received 12 June 2017
Received in revised form 26 July 2017
Accepted 16 August 2017
Available online

Keywords: Li-O_2 battery
Chemical stability
Chloromethyl pivalate
Electrolyte

ABSTRACT

A novel electrolyte with chloromethyl pivalate (CP) used as solvent was first reported for non-aqueous lithium-oxygen (Li-O_2) batteries. Since there are no α-H atoms in the structure of CP, the CP based electrolyte in both superoxide radical solution and real Li-O_2 battery environment showed good chemical stability against superoxide radicals, which was confirmed by ^{1}H NMR and ^{13}C NMR measurements. Without a catalyst in the cathode of Li-O_2 batteries, the batteries showed high specific capacity and cycling stability.

Non-aqueous rechargeable Li-O_2 batteries have received increasing attention due to their extremely high theoretical specific energy density (11000 Wh/kg), which is five times upon lithium-ion batteries [1,2]. Li-O_2 battery is one of candidates that have the potential to lead the next generation of energy directions. Despite many researchers have achieved much progress on Li-O_2 batteries, those significant obstacles are still restricting the application of Li-O_2 batteries in practice [3]. One of the prominent problems is to find an electrolyte with high chemical and electrochemical stability for Li-O_2 battery [4]. The reversible reaction (Li+O_2—Li_2O_2) within battery causes reactive radical species as peroxide and superoxide leading the decomposition of electrolytes [5, 6].

Nowadays, dimethyl sulfoxide (DMSO) and tetraethylene glycol dimethyl ether (TEGDME) as most common solvents are used in liquid electrolytes for Li-O_2 batteries [3]. Bruce *et al.* reported that DMSO based electrolyte could be used as cycling-stable electrolyte in Li-O_2 batteries [7]. However, in the subsequent report, DMSO based