Electronic Supplementary Material (ESI) for Chemical Society Reviews. This journal is © The Royal Society of Chemistry 2023

A summary of thin Li fabrication technique The details of this Li fabrication teniques (Since some of these parameters are not easy to quantify and not mentioned in the articles or patents, we here use NA to fill the blank.) The effect of the processing methods on the parity, microstructure and surface contamination (N/ not mentioned) Category Thin Li fabrication strates Brief description of the method The form of the input materials The form of the output materials (i.e. pure Li sheet, Li/Cu sheet, ... Thickness range of thin Li/µm (NA means not mentioned) Reference Simplicity Safety Scalability Cost effectiveness Thickness limit Production speed Pest-treatment NA. reducing the thickness of felium metal by cold willing it solid softwaris, commonline surfaces to weakee relatively the lithium strip thick extended Listing this Lion a metal she >40 f lifetim chart exiting from compression rollers is depen USP41, 372110, 197 NA NA. NA NA. NA NA reducing the thickness of lithium metal by hot proving thick to the Din Li en salvérators 1-20 NA CN Par, 10250401A NA NA. the fabricated Li with a width of 1-000 mm, a thickness of 1-20 mm NA NA. thick L2 secolds of a state of 0.1-3 series, the substate model at a state of 0.1-20 series, the followinted L2 with a width of 1-600 sen, a thickness of 1-20 pm NA a labricant residue which is either volatile, or electrochemically compatible inm and with the other components of a polynee electrolyte battery may be the conface of ideian the operation of lamination is containing at most 1 % or NA US Pat., 5837404, 1998 US Pat., 4517590 RI, 20 US Pat., 7513116 R2, CA Pat., 2499256, 201 NA this Li film 20-40 NA this Li film IP Pat., 198825002, 1866 IP Pat., 198625008, 288 NA this Li film thick Lisheet US Pat., 905229 82, 207 US Pat., 077991 A1, 201 <200 5- 50 NA NA. NA NA. NA NA NA Mechanical selling NA CN Pat., 88/97747 A, 2018 CN Pat., 11306465 A, 2021 applying silicon related polymer fil NA. NA ical cold electrolyte interplace on the to coppose Lidenshite prowth LeMg alkys, the detailed peoblems depend on the composition of the alky LeZe alky with improved strongth and dashity NA NA. 40 quart Likeyer composed of miliple pressed particles with stronger O sign ACS Appl. Mater. Interfaces, 2018, 10, 16521-1653 NA NA. NA > 40 pm NA NA SLMPs this Li on Cu folk 20 20 NA NA NA NA NA NA NA NA ristal lifetium follpressorus: the shape of pres thick Linkest (0.15 mm NA. NA. NA 6 in 12 5 d NA thick Lishert 20 NA NA NA. NA. NA. NA NA Micropaticle bombandese > 80 pm thick Li folk obtained from calendari pare Li shorts or Lishests on sale 1-50 It should be careful to avoid the reaction of Li with used liquids. NA NA. NA NA 1-50 µm NA onting the thickness realaced Lifek from the sandwick structure bet the polynum potentics layer and metal substanties if necessary. the respirant dult metaor of a printee Li follocome secondar and forder after chemical threing Name Lat. 2022, 22, 3047-3053 NA NA. NA. $< 15 \,\mu m$ the thinning rates sample from 0.45 percisis (1 M at 25 °C) to 5.65 particula (5 M by stirring at 25 °C) Chemical etching 100 pes thick Li on Ca feil this Li (< 15 pm) on Ca fiel 61-40 USPat, 60216, 1999 this Li os salvitus US Pat., 5389446, 1992, US Pat., 5389932, 1992 mailton Li nohen Li + functional organic co Li alloys ubuthis Li on Cu fails 10-20 e smooth top carface had similar compositions of with carbon and oxygen Nat. Commun., 2019, 10, 4930 NA. This process suppired <5 s for molton Tape carding milten Lirhard carbo the Line sub-tr LMI has a heneycond-like ste uniformly distributing in Sci. Clina Chem. 2023, 63, 1453-145 NA. multure Li + this Ste described Co Soil this Life index layer on Cu fish 10-50 Adv. Energy Mater, 2021, 11, 200229 magnetros oputariog of alcuthin Second ubsechin Li-Snackschoole with large size of 40 cm2 w NA NA. NA NA. NA maltan Livin alkey this Livin alloy on Cu folk Adv. Mater, 2021, 33, 2005305 NA NA. NA NA NA NA this Li on salester this Lines metal shorts miles Li NA NA. NA NA. NA NA miles Li this Li on saledou 10-80 CN Pat., 104062800 A, 200 NA NA. degreasing, coarsoning, and plating a coats Dip costing CN Pat., 20075648A, 2009 Gener Balletis, 2020, 65, 7907-CN Pat., 11226217 A, 202 Li-ther commo Melt farring mites Li this L1 film on substrates with a protective in 5-100 NA CN P4., 101107/08 A, 202 NA NA. NA NA. 1-02 cm/s NA. NA Tampicing metho Nat. Energy, 2021, 6, 780-788 NA Comparable to communished 100-pere thick Li motel fields NA. 3–9 (depends on the deposition time and current density) NA NA. NA. NA NA. 135 pm thickness) and khizes respectively as counter and reference electede this Line substantes Electrolin Acts, 2016, 114, 300-337 salfulgue Augew. Chon. Int. Ed., 2017, 56, 14207 - 14211 CN Pat., 200340778.A, 2018 64412168 6.1 - 10 columnar and aniform L NA NA NA NA. columnar and uniform Li on LiF-post NA. NA 5-30 NA NA. NA NA NA. NA Lizething appear mires this Li films on Ca salestaat The film morphology is controlled by varying the current domines in a r index (1–14 mcCon2), to produce uniform nanorodi, spheres, and cub configurat influence over the stream and electrochemical respects ACS Onega, 2018, 3, 181-187 NA skeakite dass Li fikus frick Li fiel (> 80 µm) o < 20 IN Pat., 88860218 A, 201 NA NA. NA NA < 25 NA NA. NA NA NA NA 50 per thick Li fiel < 25 pm thick L NA CN Pat., 10927664 A, 2019 tick Line 5.6 NA NA NA NA NA at a current density less than 3 mA.com with a deposition less more than 1.5 I NA this Li film NA. thick Li follor Li containing cathode this Li Sless on lithiophile fiber coated Ca fee < 20 NA CN Pat., 112216811 A, 2021 NA NA NA. PVD processing has an impor-the loss metal is required, fi the product cost. As a result, advantage with PVD costed connection with PVD costed Coating width 100 mm Winding speed: 0.2 - 2.0 minute Coating: Li, single or dashte-sized Li finikases: 1 - 30 pm/per side Coarling width 100 mm Winding opend: 0.2 – 2.0 m/min Coarling 11, single or dishle-sided Li thickness: 1 – 20 pm/per side Li savor flore 1 - 20NA a few nonometres to a theorematic of nonomati thin Li film on substantes (this metallic fields or metallized polymer film vacuum deposited Lithiam has minimal or namely high levels of parity NA and calestania. Lo ator is orgapped system. Li sapor firm this Li costings on electrically co 12-38 nt degraded by sir

NA

net degraded by a

Table S2 Thin Li fabrication techniques and their corresponding details