

磷酸铁锂-碳复合材料

行 业:	Chemistry
进料尺寸:	< 50µm (checked microscopical)
最终精度:	d50 < 10nm
样 品 量:	40ml
研磨建议:	A grinding of sample is possible with our Planetary Micro Mill PULVERISETTE 7 premium line. We recommend using bowls made of zirconium oxide with 1mm balls for pre grinding and 0,1 mm Ø balls for maximum endfineness. A further reduction of endfineness might be possible by grinding in a proper solvent / respectively with the proper grinding agents (acids / bases / tensides / salts /



PLANETARY MICRO MILL PULVERISETTE 7 PREMIUM LINE

main disk speed: 1100 rpm

80 ml grinding bowl made of zirconium oxide (ZrO₂)
+ 100g of 2 mm Ø ZrO₂ balls

Feed quantity:	8,5 g (~ 15 ml)
Feed Size:	max 50 µm (checked by optical microscope)
Additive:	+ 27ml IPA
Grinding time:	30 min
Final fineness:	d50 < 750 nm
Comments:	<p>To hinder a sticking of sample, only a grinding in suspension is possible. Best grinding result should be achieved in motor oil like slurry. Therefore, we added 27 ml of isopropyl alcohol (IPA) to the sample.</p> <p>To avoid overpressure, we ground the sample in steps of 3 minutes, followed by a programmed pausing time of 9 minutes. After several cycles, the outside temperature of the bowl should be checked (remain below 70°C); grinding time or programmed pausing time might be readjusted afterwards. This is counting for all further trials too.</p> <p>After the first 15 minutes of grinding, a fineness of d50 < 750nm has been achieved (see meas. no. 52693 on separate page). Afterwards the fineness did not change significantly, therefore we recommend changing the balls from 2mm Ø to 0,1mm Ø can be done at least after 30 minutes of grinding.</p>



PLANETARY MICRO MILL PULVERISETTE 7 PREMIUM LINE

main disk speed: 1100 rpm

80 ml grinding bowl made of zirconium oxide (ZrO₂)

+ 100g of 0,1 mm Ø ZrO₂ balls

Feed quantity:

8,5 g (~ 15 ml)

Feed Size:

d₅₀ < 750nm (see result 1)

Additive:

+ 23ml IPA (Σ: 50ml IPA)

Grinding time:

+ 90 min (Σ: 120 min)

Final fineness:

d₅₀ < 140 nm

Comments:

Because the fineness did not change significantly in result 1, we changed the balls to 0,1mm diameter in this trial.

To maintain an optimum viscosity, we added 22ml of isopropyl alcohol additionally.

After totally 2 hours of grinding, we checked the fineness with our Laser Particle Sizer ANALYSETTE 22 NanoTec plus again. A d₅₀ of < 140nm has been detected (see meas. no. 53924 on separate page).

Because of missing Mie-parameters, the detected result will not be as precise as possible.

Probably the grinding result can become improved by using other solvents or different grinding agents like tensides.

A small sample has been taken after totally 60 minutes of grinding (see separate micro tube).



PLANETARY MICRO MILL PULVERISETTE 7 PREMIUM LINE

main disk speed: 1100 rpm

80 ml grinding bowl made of zirconium oxide (ZrO₂)

+ 100g of 1 mm Ø ZrO₂ balls

Feed quantity:

8,5 g (~ 15 ml)

Feed Size:

max 50 µm (checked by optical microscope)

Additive:

+ 33ml IPA

Grinding time:

60 min

Final fineness:

d₅₀ < 570 nm

Comments:

A further trial has been done with 1mm Ø balls in the beginning. In this trial, we kept on grinding with those balls for 1 hour. Afterwards, the endfineness has been lightly better as the 20 minutes result with 2mm Ø. But as shown in result 1, only a minimal improvement has been found after 30 minutes of grinding. Therefore, a grinding for only 30 minutes might be fulfilling too.

A small sample has been taken after totally 60 minutes of grinding (see separate micro tube).



PLANETARY MICRO MILL PULVERISETTE 7 PREMIUM LINE

main disk speed: 1100 rpm

80 ml grinding bowl made of zirconium oxide (ZrO₂)
+ 100g of 0,1 mm Ø ZrO₂ balls

Feed quantity:	8,5 g (~ 15 ml)
Feed Size:	d ₅₀ < 570nm (see result 3)
Additive:	+ 10ml IPA (Σ: 43ml) + 10 drops of Disperbyk 2025
Grinding time:	+ 60 min (Σ: 120 min)
Final fineness:	d ₅₀ < 115 nm
Comments:	<p>After changing the 1mm Ø balls from result 3 to only 0,1mm Ø; we added 10ml of isopropyl alcohol and added 10 droplets of the tenside Disperbyk 2025 (BYK-Chemie; Wesel; Germany). Usually up to 10% of tenside can be given to the sample to maintain an optimum dispersion of particles.</p> <p>Afterwards, we ground the sample for 60 minutes (totally 2 hours of grinding) at full speed (1100 rpm).</p> <p>We checked the fineness with our Laser Particle Sizer ANALYSETTE 22 NanoTec plus (see meas. no. 53914 on separate page). Two small peaks at 10µm and 20µm might be caused by small air bubbles (from Disperbyk).</p> <p>The grinding result has been lightly improved. Just as mentioned in result 2 - no proper Mie-parameters are given.</p> <p>Longer grinding times might be possible as well as using other solvents or grinding agents might improve the grinding result.</p>