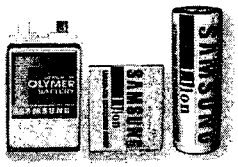
리튬이온전지용 부극활물질의 최근 개발동향

김 성 수 박사

(삼성 SDI)

리튬이온전지용 부극활물질의 최근 개발동향



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中央研究所 에너지**開發**팀

김성수, 新田芳明, 정복환

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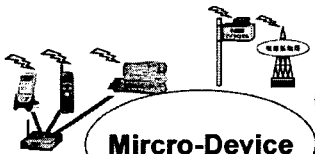
❖ 2차전지의 시장은?



Mircro-Device

非常用電源
(IT関連)

ITS物流管理

Information Network

情報端末
通信、PDA

Batteries

情報管理

Environmental Solution

医療用

分散電源用
Co-Generation

自動車用
HEV, EV, ES, EB

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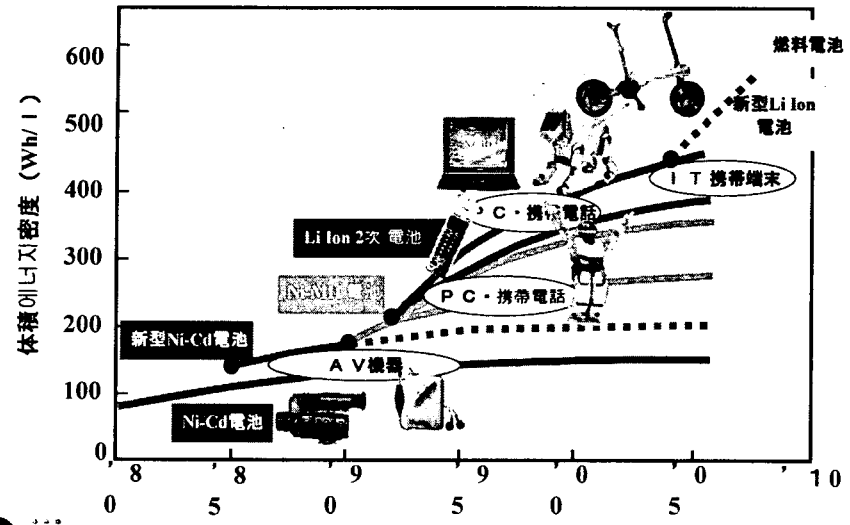
❖ 2차전지의 장래는?



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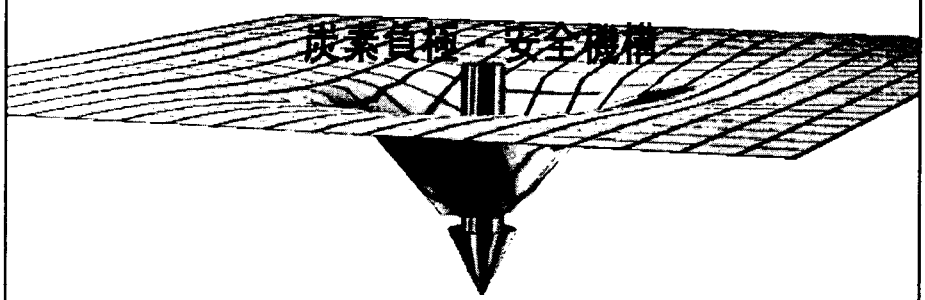
❖ Li 2차전지의 실용화를 위한 Breakthrough

軍事,宇宙 開發用 LIB技術

1950年代 末 NASA



1991年 SONY 商品化

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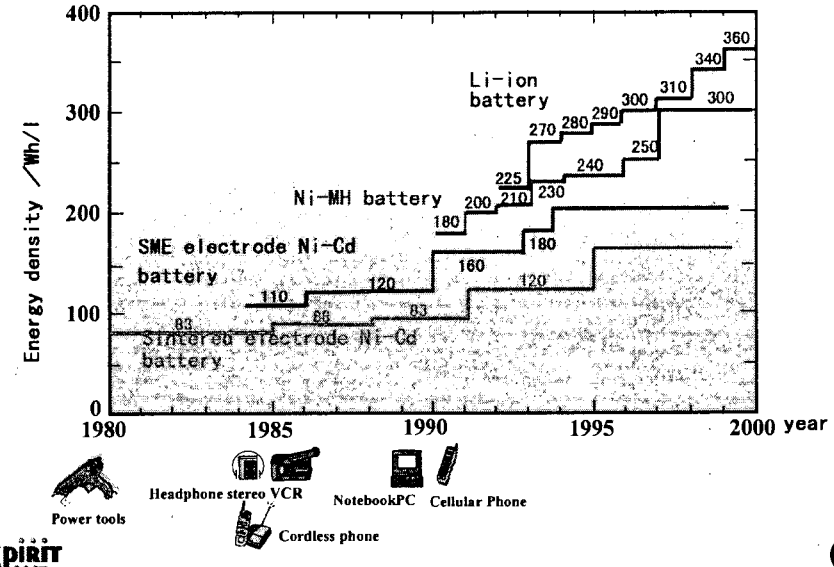
❖ 2차전지의 에너지밀도변화는?-1



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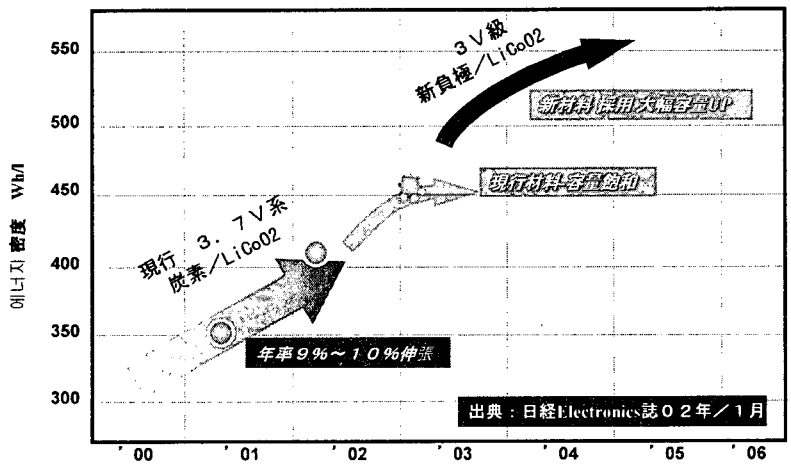
❖ 2차전지의 에너지밀도변화는?-2



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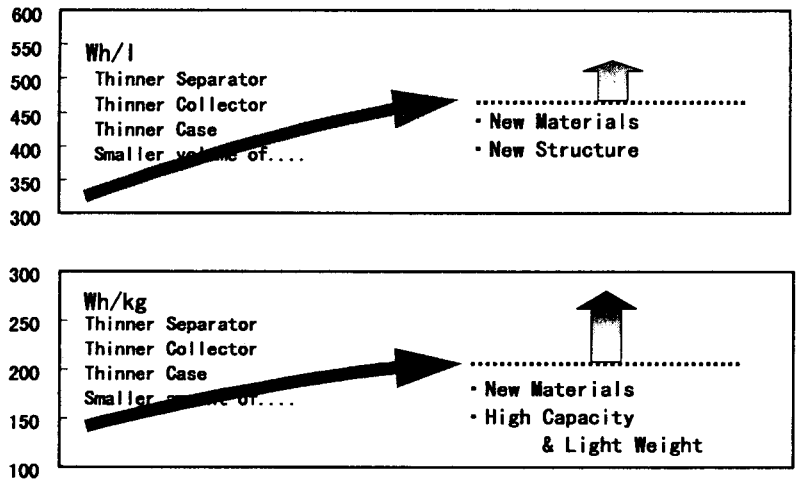
❖ 신형 Li 2차전지의 Breakthrough는?



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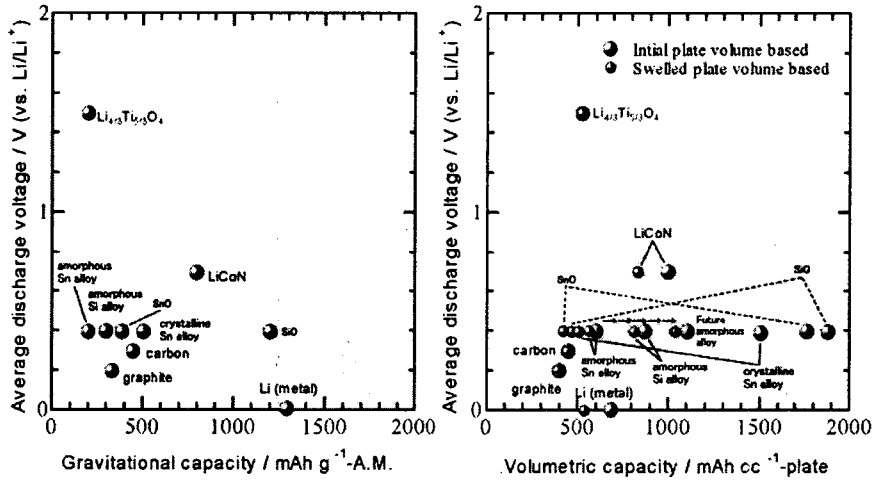
❖ 신형 Li 2차전지의 부극재료는?



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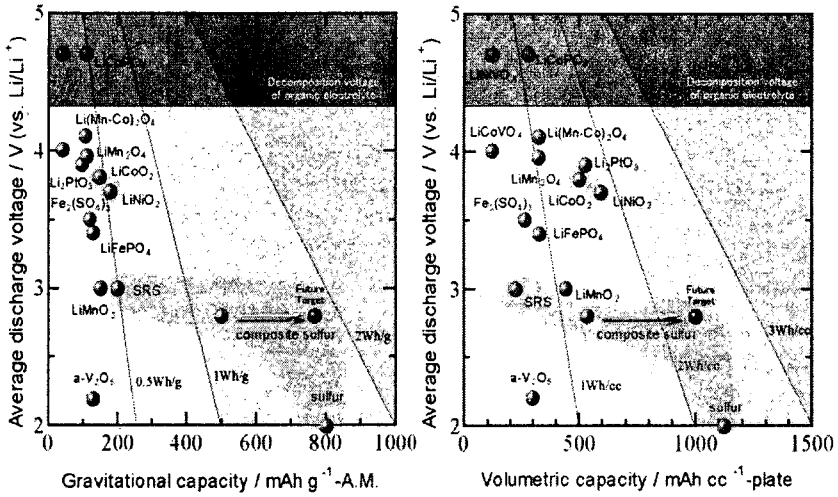
❖ 신형 Li 2차전지의 정극재료는?



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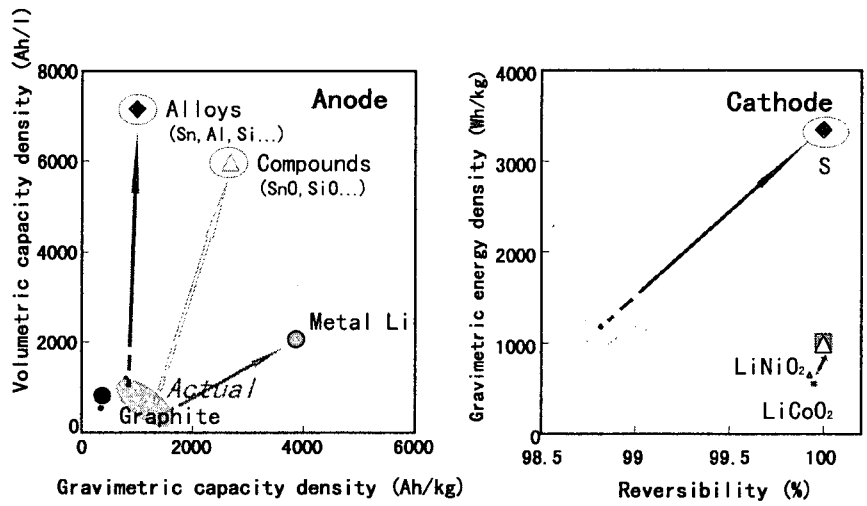
❖ 신재료에 대한 기대는? – 실제값 vs. 이론치



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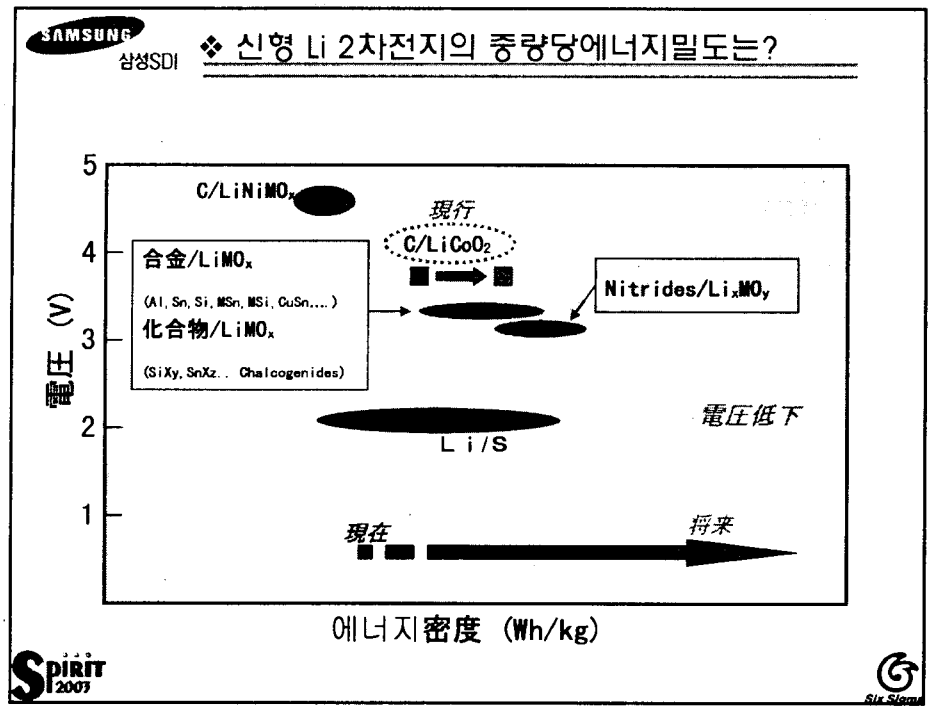
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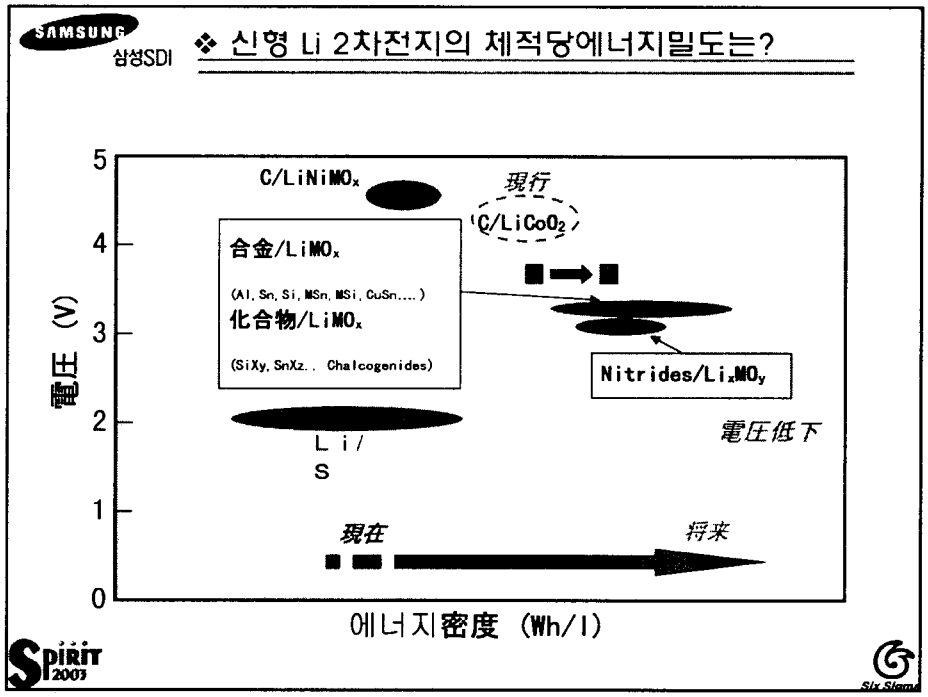
삼성SDI
❖ 신형 Li 2차전지의 중량당에너지밀도는?
5
4
3
2
1
電圧 (V)
C/LiNiMOx
現行
C/LiCoO2
合金/LiMOx
(Al, Sn, Si, MSn, MSi, CuSn....)
化合物/LiMOx
(SiXy, SnXz.. Chalcogenides)
Nitrides/LixMOy
電圧低下
Li/S
現在
将来
에너지密度 (Wh/kg)
SPIRIT 2007
Six Sigma


SAMSUNG
삼성SDI
❖ 신형 Li 2차전지의 체적당에너지밀도는?
5
4
3
2
1
0
電圧 (V)
C/LiNiMOx
現行
C/LiCoO2
合金/LiMOx
(Al, Sn, Si, MSn, MSi, CuSn....)
化合物/LiMOx
(SiXy, SnXz.. Chalcogenides)
Nitrides/LixMOy
電圧低下
Li/S
現在
将来
에너지密度 (Wh/l)
SPIRIT 2007
Six Sigma

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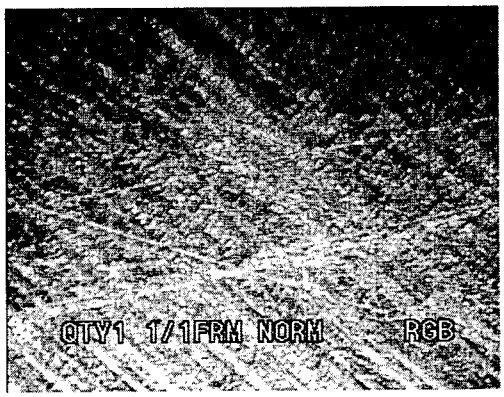
❖ 신형 Li 2차 전지의 부극 재료1-금속

금속은? 열화원인은?



금속박막 시험전극관찰(동영상)

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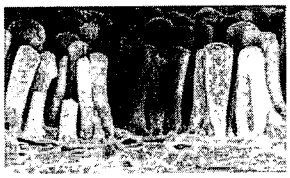
❖ 금속재료의 approach?

Initial

1st discharge



三洋 發表 資料

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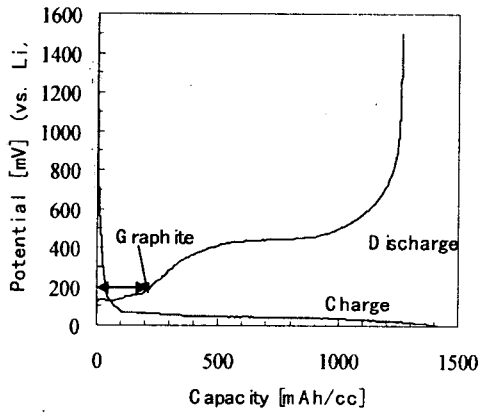
❖ 금속재료의 typical characteristics



1st charge-discharge curves of Ni-Si alloy(Ni-52wt%Si).

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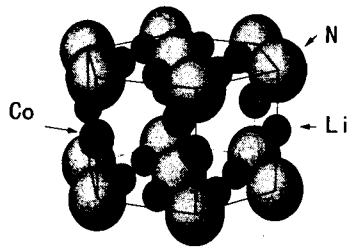
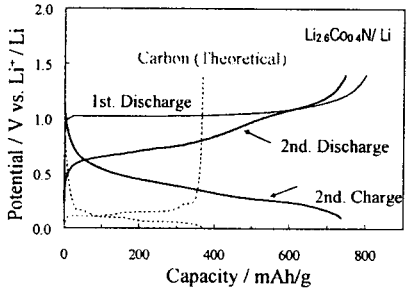
❖ 신형 Li 2차 전지의 부극 재료2-질화물1



Crystal structure of $Li_{3-x}Co_xN$



Potential Curves

Profile of Nitride

- **Light Weight**
  Specific gravity **2.1 g/cc** (almost the same as graphite)
- **High Capacity**
  700 mAh/g (twice vs. graphite)
- **Potential**
  0.7~0.8V vs. Li^+ /Li

松下 發表 資料

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❖ 신형 Li 2차 전지의 부극 재료2-질화물2

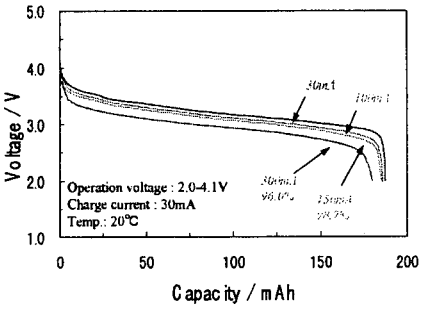
松下 發表 資料

Profile ($Li_xCoO_2/Li_{2.6}Co_{0.4}N$ battery)

Cathode:Li_xCoO_2, Anode: $Li_{2.6}Co_{0.4}N$, Electrolyte: $LiPF_6$ / EC-EMC,

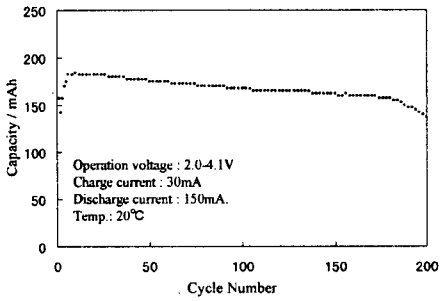
Size: small prismatic battery(22*27*5 mm)

Rate performance



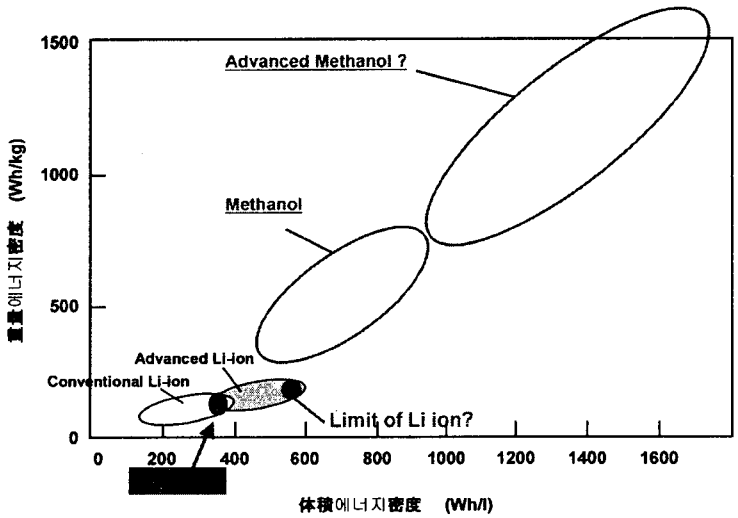
Discharge curves at various currents

Cycle performance



Cycle performance

❖Post Li Ion은?



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❖마치며

■현재의 Li Ion 2차 전지의 Breakthrough :
전지시스템 설계 고려를 통한 신전극재료 채용

■출력전압 다양성에 의한 에너지 고밀도화 :
Device회로설계를 통한 전지능력 극대화

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