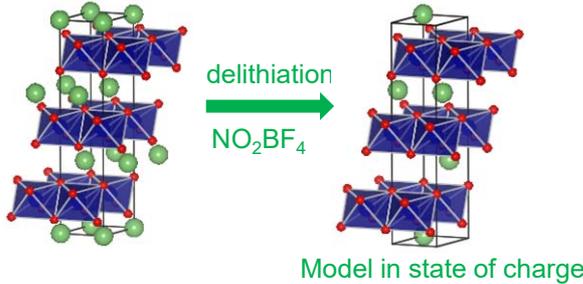
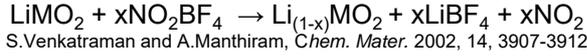


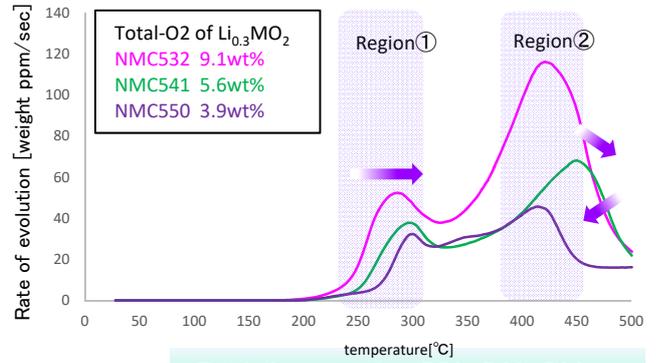
Thermal stability analysis of NMCs with various Co concentrations

In this study, we synthesized 3 chemically delithiated NMCs using a strong oxidizer, NO_2BF_4 and evaluated their thermal stability and structural change in various concentrations of Co. Total amount of oxygen evolution after heating decreased in lower Co concentration ($532 > 541 > 550$), but generation behavior was different in low and high temperature regions. Layered phase with Li site mostly filled was detected in 541 and 550 at 200°C by HT-XRD, which implies that this phase has an effect on thermal stability of cathode.

1. Sample preparation and their thermal stability



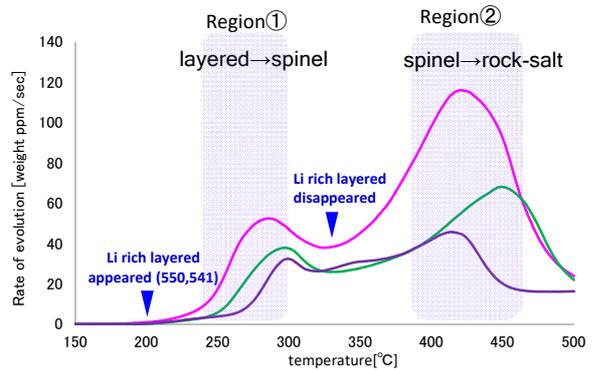
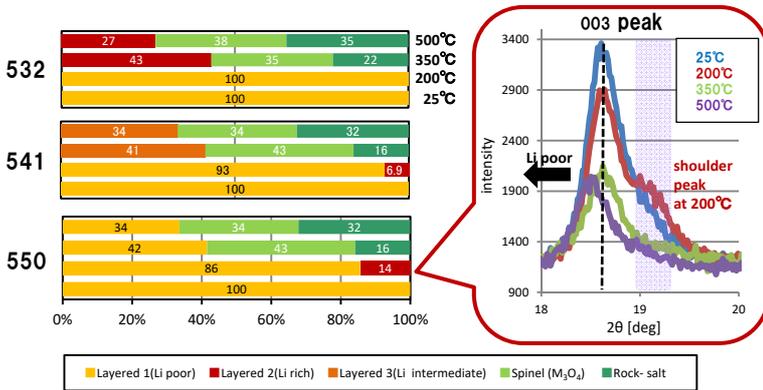
※NMC: provided by Mitsuharu Tabuchi, AIST, Osaka, Japan



- Total-O₂ generation: 550 < 541 < 532
- Different generation behavior

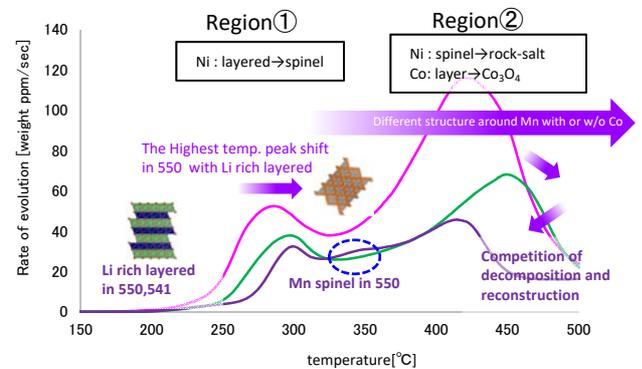
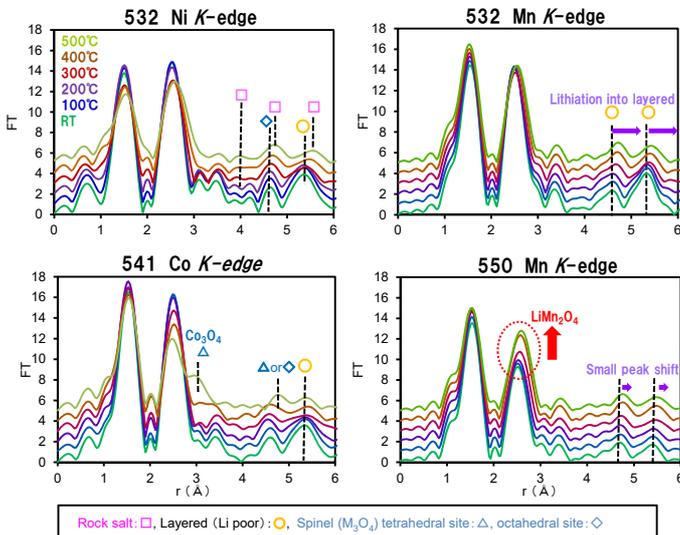
2. Relationship between thermal stability and structural change of delithiated Li_{0.3}MO₂

Ratio of crystal phases by HT-XRD [%]



In region 1 ①: Li rich layered might effect on thermal stability.

Local structure around transition metals by FT-EXAFS



Thermal stability in NMCs

- Ni, Co: one-way degradation with O₂ generation due to structural change
- around Mn: reconstruction with lithiation, in addition to degradation
- We need to design in both viewpoints of O₂-generation amount and temp. for the balance between degradation and reconstruction.