Kinetics of Al-Li-X Scrap Recycling

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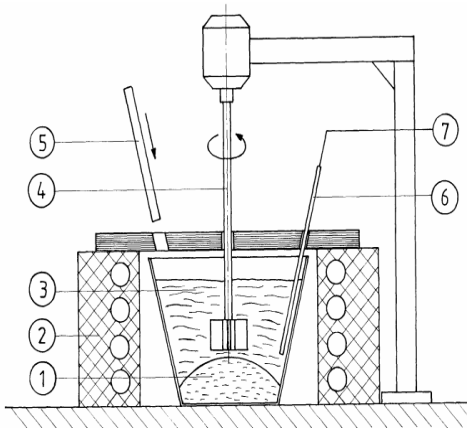
project target

- Reduction of alloying element losses (Li, Mg)
- Minimisation of Sodium and Kalium pick ups from the recycling salt (max. spec. : 5-20 ppm of Na resp. K)

Investigation method

- Thermodynamical calculations using FACTSAGE
- Labscale experiments - Kinetics of Li transfer into the salt-melt while changing salt-compositions
- determination of metal and salt-composition after recycling treatment using ICP analysis



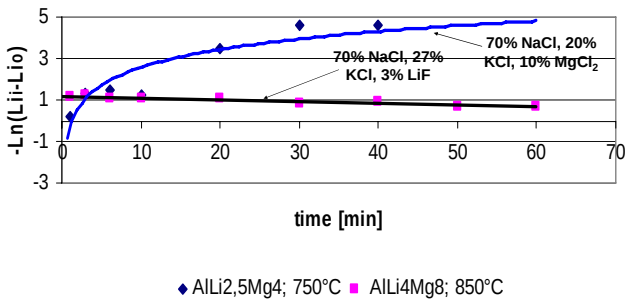
1-melt
2-furnace
3-salt melt
4-stirrer
5-sampling device
6-refractory pipe
7-thermocouple

Lab scale equipment used for Al-Li-Me recycling tests
(T_{max}: 850°C, Rpm_{max}.: 400, Metal input : 200g)

Experimental results

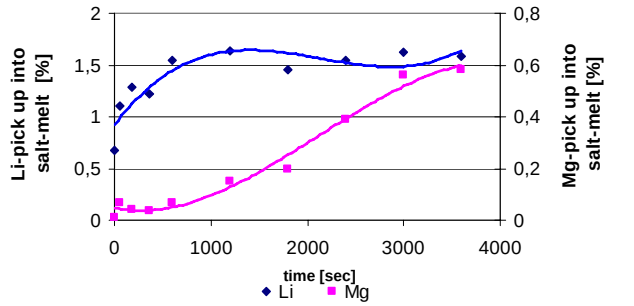
71NaCl/26KCl/3CaF_2 55NaCl/45KCl/2CaF_2	95% Li- and 30% Mg-loss, enrichment of Na, K to 1000ppm standard recycling salt
70NaCl/20KCl/10$MgCl_2$	99% Li-loss, no Mg-loss, Na, K-enrichment to 1200ppm modified salt
70NaCl/27KCl/3LiF 70NaCl/27KCl/3LiCl	low Mg-loss, enhanced Li-loss enrichment of Na, K to 800ppm modified salt
80KCl/20LiCl 70KCl/30LiCl 50KCl/50LiCl 47KCl/53LiCl 20KCl/80LiCl	5-10% loss of Li- und Mg, K-enrichment to 200ppm modified salt
70KF30LiF	95% loss of Li, K-enrichment to 100ppm modified salt
100LiCl	**100% Li and Mg recovery, no K and Na-enrichment**

Kinetics of Li enrichment in the recycling salt (different reactions models)

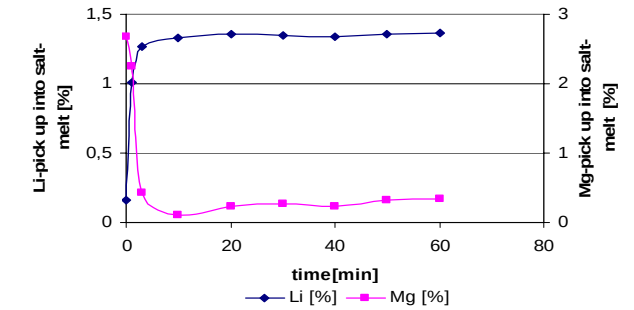


◆ AlLi2,5Mg4; 750°C ■ AlLi4Mg8; 850°C

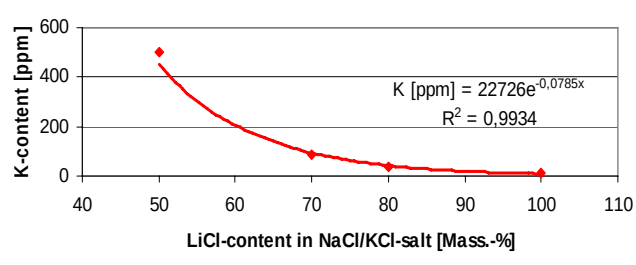
Kinetics of Li- and Mg transfer of alloy AlLi4Mg8 (T=800°C, 70NaCl+27KCl+3LiF Salt-melt)



Kinetics of Li- and Mg transfer of alloy AlLi2,5Mg4 (T=750 °C, 70NaCl+20KCl+10MgCl2-salt-melt)



K-content in metal (AlLi4Cu4) vs. LiCl content of recycling salt



Conclusion

In order to avoid Na and K pick up into the recycled Al-Li alloys only high purity LiCl can guarantee a sucessfull recycling treatment. High purity LiF was not applied because compared to LiCl salt slag LiF salt slag can not be recycled

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