

SELEÇÃO LÍTIO – PROVA DE INGLÊS






ARTICLE

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The impact of anthropogenic inputs on lithium content in river and tap water

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INTRODUCTION

During the last two decades, industrial demands for lithium (Li) resulted in a dramatic increase in Li production and, in 2017, the world production of Li from minerals and brine was 43,000t. As the secondary Li-ion battery (LIB) is a major and growing industrial channel for the element, approximately 660 million cylindrical Li-ion cells were produced in 2012, of which Korea shared 21% of total LIB manufacturing capacity. Lithium is also incorporated into alloys and is widely used as a therapeutic drug for treating bipolar disorder since its discovery in 1970. Although future demands will continue to grow and Li recycling may become an integral part of Li business, there are still few disposal process guidelines for waste LIB. Furthermore, there is a gap in our knowledge concerning the impact of these materials on Li levels in the environment as well as in municipal waters. The biological effect of high Li levels on the diet of several organisms and human beings has however been already reported in several publications. For aquatic organisms, most of published studies have shown that elevated aqueous Li levels induce toxic effects. Concerning humans, a growing number of studies have reported an inverse relationship between Li concentrations in drinking water and suicide mortality indices (in the USA, Japan, and Lithuania), consistent with its biological role in brain cells. In contrast, elevated Li concentrations in drinking water may be deleterious and disturb Ca homeostasis during pregnancy. Interestingly, Li isotopes (the ratio of $^7\text{Li}/^6\text{Li}$) have been used by Earth scientists and geochemists since, when measured in rivers and soils, they provide key information on soil sustainability and weathering rate on continents, and therefore on the carbon cycle. They are considered as a key isotope proxy of unraveling why and how global climate could be regulated over geological timescale. Thus, for all these reasons, it becomes increasingly important and urgent to quantify the amount of environmental Li that comes from anthropogenic activities. However, determining the conditions under which Li concentration or Li isotope signature can be impacted by anthropogenic activities remains a challenge.

Here, to test the effects of anthropogenic activities, we sampled and analyzed different types of water from the Han River (HR) basin. This river is the largest river system in South Korea, in terms of discharge and drainage area, and drains the Seoul Special Metropolitan City (Seoul), the capital and largest metropolis of South Korea. The population of the HR basin is estimated to be 12 million, of which more than 82.7% live in Seoul. Thus, this basin offers a unique opportunity to compare the upstream-inhabited part (although characterized by several dams) with the area of Seoul, located downstream of the Paldang Dam, and which is strongly impacted by urban and industrial activities. The downstream section of the Han River is also the main source of tap water for Seoul citizens. Our study provides the first Li isotope data of industrial products, allowing us to explain the significant Li-enrichment measured in the wastewaters, as well as the high Li contents in the Han River and tap water collected in the highly populated agglomeration of Seoul.

Perguntas & Respostas

1. Cite:

a) dois usos importantes do lítio na sociedade moderna e

Resposta: baterias (cilíndricas) de lítio - LIB e droga terapêutica para distúrbios bipolares

b) dois impactos ambientais relacionados a presença de lítio na água.

Resposta: Altas concentrações podem causar efeitos tóxicos em diversos organismos e podem alterar a homeostasia do Ca durante a gestação de humanos. Já baixas concentrações podem levar a uma redução dos índices de suicídio.

2. Qual as informações que se pode obter com estudos dos isótopos de lítio?

Resposta: Podem ser obtidas informações sobre:

- sustentabilidade do uso do solo;
- taxa de intemperismo nos continentes
- ciclo do carbono → como mudanças climáticas regularam o clima

3. Qual a importância de se estudar o rio Han?

Resposta: Porque:

- é o maior sistema fluvial da Korea do Sul (vazão e área);
- drena a reunião metropolitana de Seul (capital e cidade mais populosa, com impactos urbanos e industriais);
- possui áreas inabitadas na região mais à montante e com reservatórios;
- fonte de água potável para cidadãos (água de torneira)