4.3.13:Automated Content Analysis of Rare Earth Research from 1965 to 2018

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Background

The exponential growth of scientific literature – which we call the 'big literature' phenomenon – has created great challenges in literature comprehension and synthesis. The traditional manual literature synthesis processes are often unable to take advantage of big literature due to human limitations in time and cognition, creating the need for new literature synthesis methods to address this challenge. Automated Content Analysis (ACA) is a specific algorithm that is designed to treat large texture information and provide a visual output. It has been developed since 1990s, and the original process includes sifting, classifying and simplifying of published research. In this project, we are looking into how the research topic changes in the last 50 years, and make some expectations in the developing trend in the future.

Methodology

Data Preparation

- ▶53,836 abstracts about rare earth elements (REEs) from Scopus
- ▶Impact factor ≥1.00
- ▶Time range from 1965 to 2018

Manual Reading

- ▶50 papers
- ▶to get a comprehensive understanding about different topics in REEs

Dictionary Construction

- ▶**REEs:** cerium (Ce), dysprosium (Dy), erbium (Er), europium (Eu), gadolinium (Gd), holmium (Ho), lanthanum (La), lutetium (Lu), neodymium (Nd), praseodymium (Pr), promethium (Pm), samarium (Sm), scandium (Sc), terbium (Tb), thulium (Tm), ytterbium (Yb), and yttrium (Y).
- ▶**REEs Application:** Alloy, Catalyst, Ceramics, Coating, Doping, Fluorescence, Hybrid_Vehicle , Laser, Magnet, Nanoparticle, Nuclear, Optical, Phosphors, Superconductor, X-ray
- ▶**REEs Manufacturing Research** Beneficiation, Annealing, Antiferromagnetism, Chemical Treatment, Electrolysis, Melting, Metallurgy,
- ▶**Mines and Rocks** Allanite, Apatite, Bastnasite, Brannerite, Carbonatite, Eudialyte, Euxenite, Fergusonite, Florencite, Loparite, Monazite, Pegmatite, Perovskite, Placer, Pyrochlore, Tellurite, Xenotime, Zircon
- ▶**Environmental and Economics** Economic, Environmental, Policy, Recycle

ACA Process

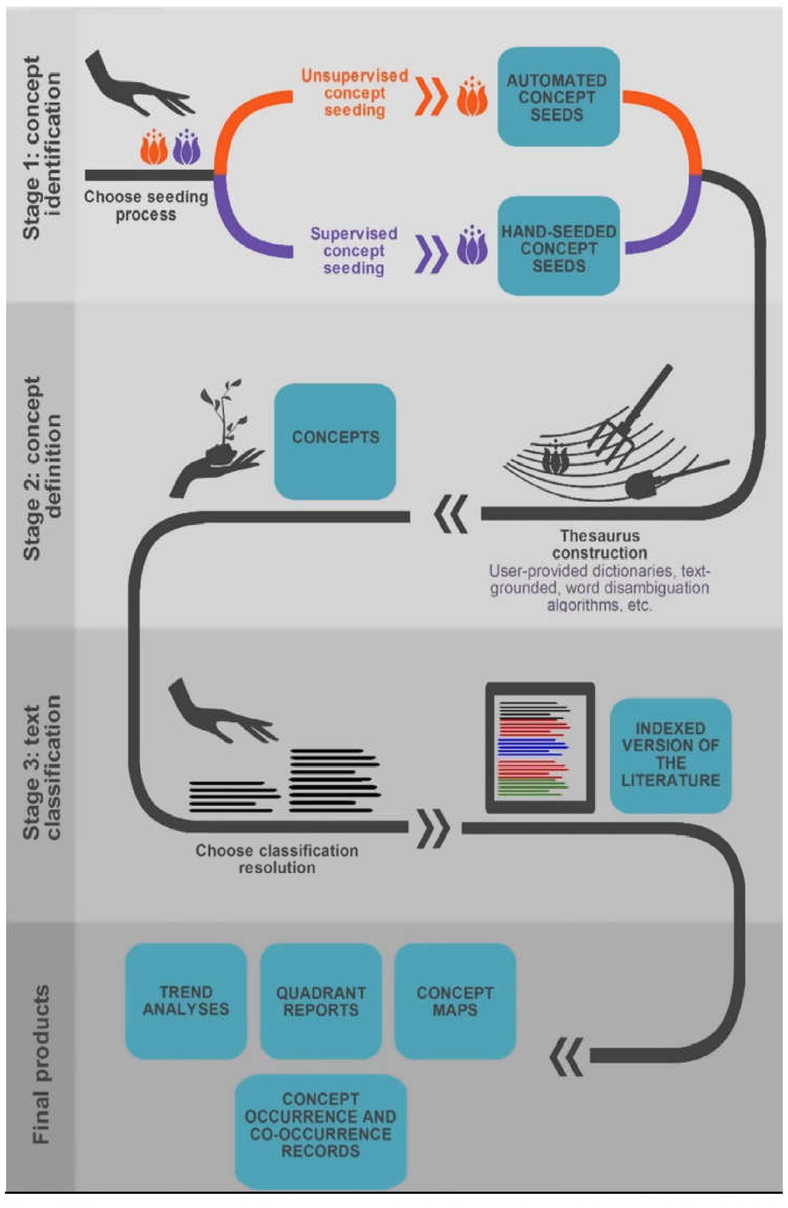

Fig. 7 The Automated Content Analysis Procedure (Nunez-Mir, 2016)

Results

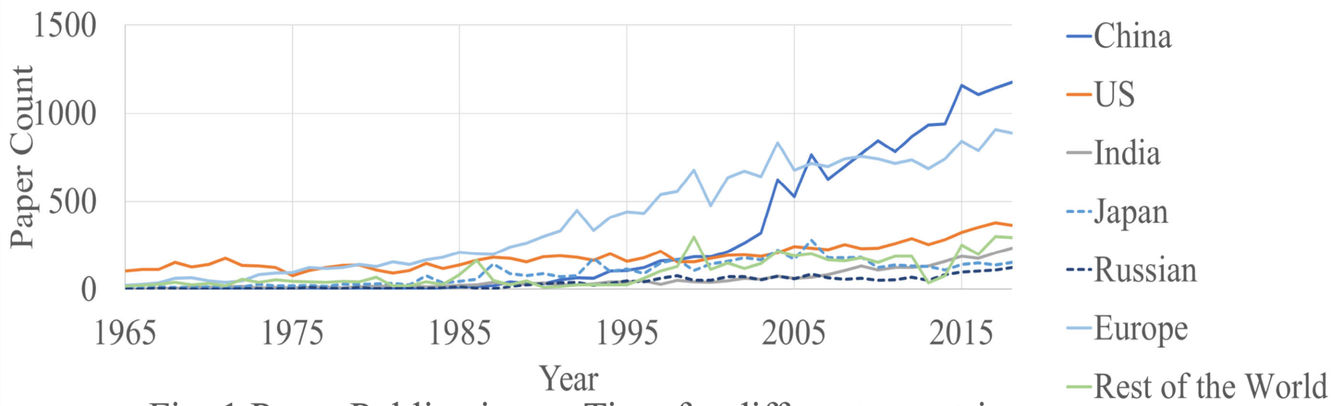

Fig. 1 Paper Publication vs Time for different countries

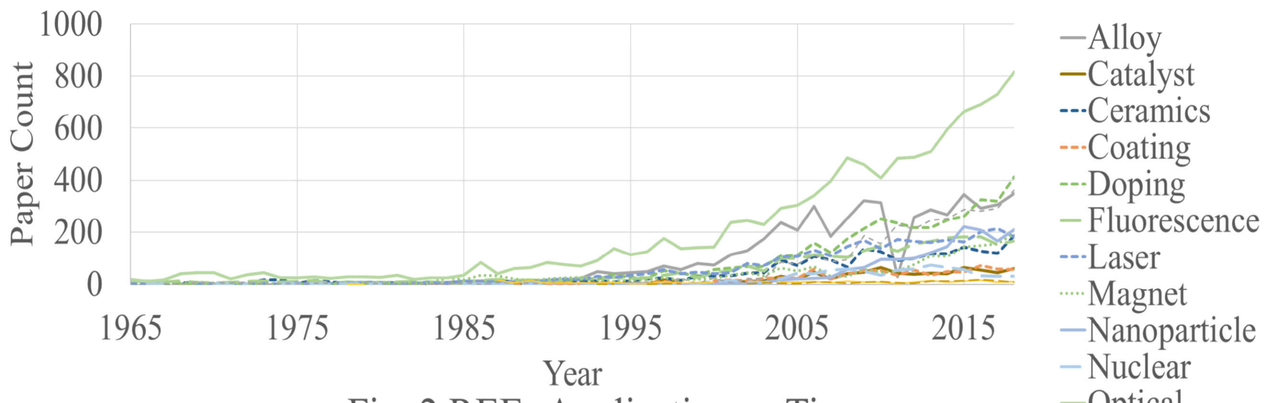

Fig. 2 REEs Application vs Time

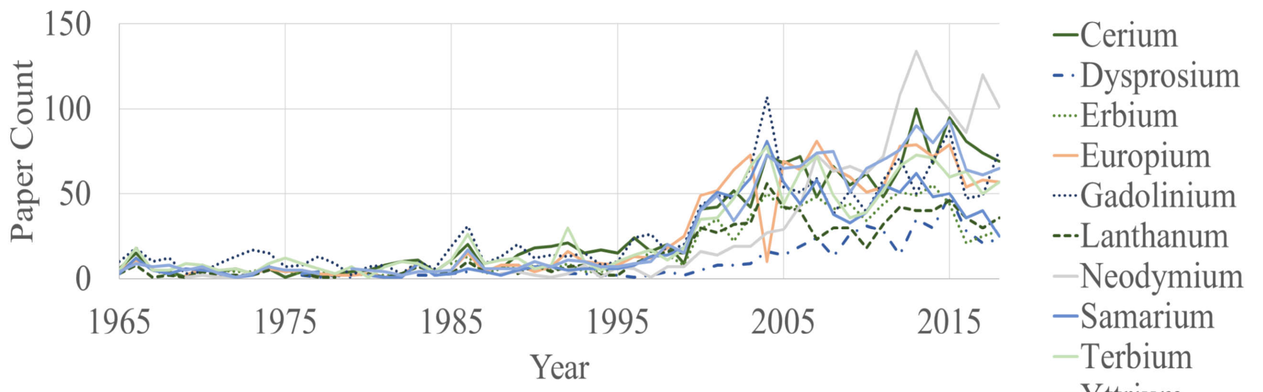

Fig. 3 RE Elements vs Time

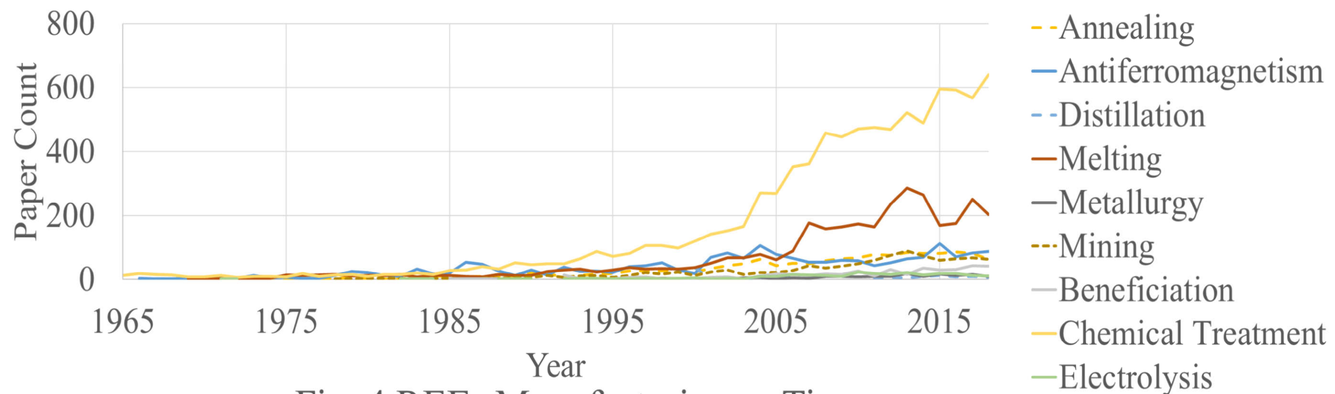

Fig. 4 REEs Manufacturing vs Time

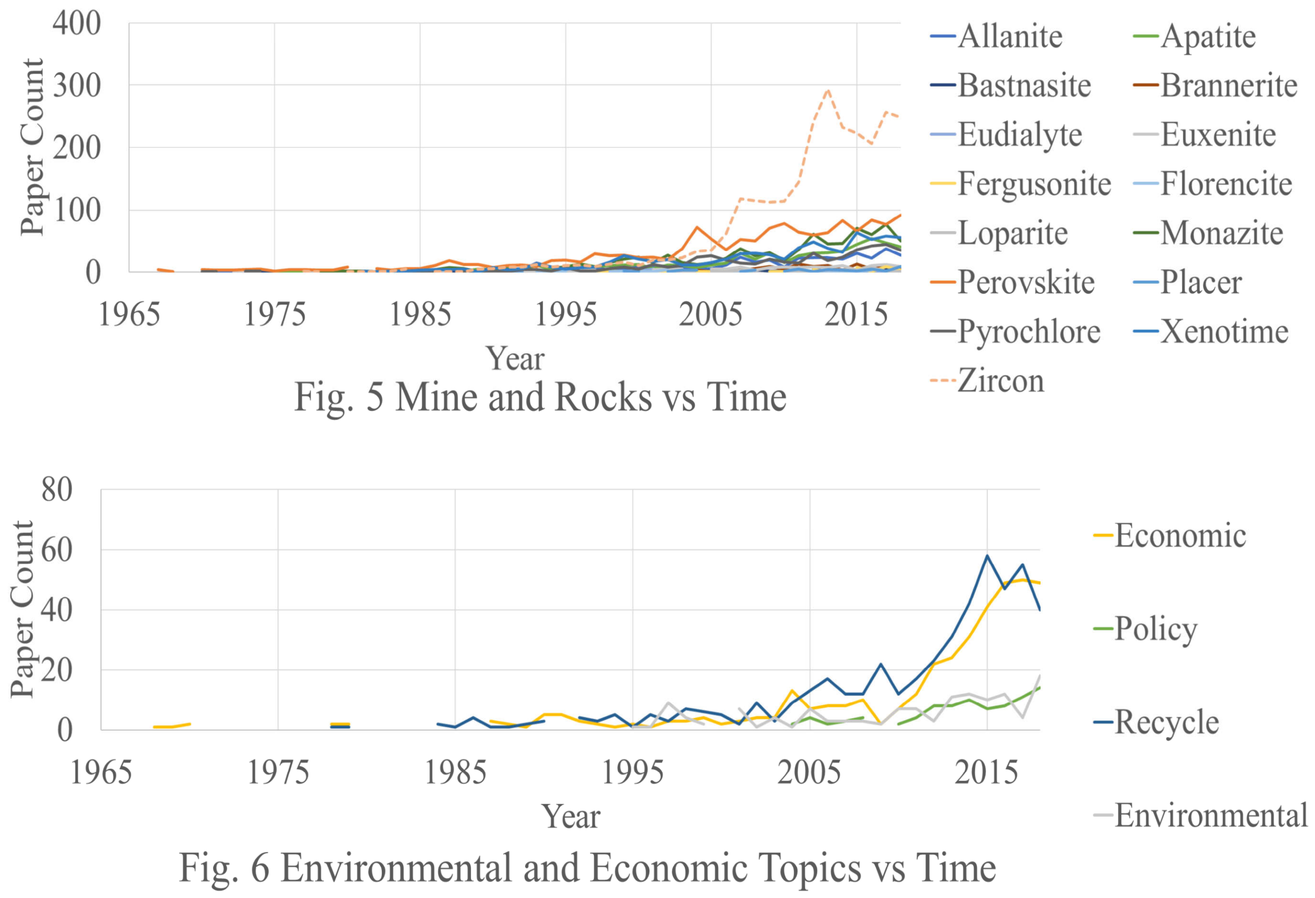

Fig. 5 Mine and Rocks vs Time

Fig. 6 Environmental and Economic Topics vs Time