

Ecosystem Impacts of Critical Material Recovery and Processing: Ecotoxicity Testing on DGA Extractants

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Modern technologies are heavily dependent on the critical material (CM) used to construct them. Emerging CMI research evaluates the effectiveness of new recovery and treatment processes, but there is some concern about the waste generated from these efforts. Our project goal is to assess the environmental toxicity of the newly developed CM processing and recovery technologies to avoid producing emerging environmental contaminants. Our experimental platform includes a series of ecological toxicity tests to assess the potential environmental impacts of new critical material recovery or recycling technologies. This will include rare earth element complexing DGAs such as TODGA, DGA6, DMOEGA, and the process-relevant solvents, Isopar-L and 1-octanol. The ecotoxicity indicators chosen include the wastewater bacterium *Nitrosomonas europaea*, the small crustacean *Daphnia magna*, and the green alga *Raphidocelis subcapitata* (formerly known as *Selenastrum capricornutum*). Preliminary data on the ecotoxicity impacts of DGAs and a comparative analysis of complexants will be presented. This data will be benchmarked against the current standard of CM recovery that uses reagent PC-88A. This knowledge can be used to identify critical material processing techniques with a lower impact and / or waste remediation strategies to reduce environmental toxicity. Our project benefits society by providing a basis for understanding how critical material recovery affects the environment and how remediation strategies can aid in the detoxification of processing waste.