Greener Ionic Liquids (ILs) as efficient and environmentally acceptable lubricant additives

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The field of tribology has had, since the first mention at the beginning of the 20th century, a large contribution and development from the field of ionic liquids (ILs) as lubricating agents. ILs are molten salts at room temperature, and exhibit many properties that are desirable in lubricants, such as their non-flammability, non-volatility, low melting point, outstanding thermo-oxidative stability, and dipolar structure. All these, along with the new-era lubrication requirements, make ILs ideal candidates for their research and development as new generation lubricant or lubricant additives. Consequently, since the first mention of their potential advantageous use in the field of tribology, the number of papers and patents of these types of materials has experienced an outstanding exponential growth.

ILs have the advantage of being very versatile materials, since their potential designability is only as limited as the synthetic chemists' mind that works with them. The chemical structure of ILs can be tailored so that the concomitant physico-chemical properties can be optimal to the specific task they are required for. As such, ILs appear as an easy to synthesize lubricant additive alternative, that can be optimized for a specific application. One key property that has propelled further the interest in these materials is their potential greener approach when compared to other, more traditional, lubricant additives. Although at present many ILs have the downside of heavy use of halogens as their component atoms, which promptly form halogen halides along with the toxic implications these have, a potential new course of action could be an environmentally conscious chemical formulation. This would resolve the halogen presence problem, and make ILs more competitive against the common practices. As such, this is the aim we have in our group.

ILs that present an environmentally acceptable chemical structure should do not have to compromise in terms of tribological performance. Therefore, and optimal balance between green formulation and presence of tribologically active species is a challenge we aim to resolve in the near future. In order to achieve this, we intend to use functionalized biomolecules, in an attempt to eliminate the current relationship between efficient lubrication and environment.

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