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Biolubricants Based on Vegetable Oils

From Raw Materials to Specific Uses

Springer

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In family life, love is the oil that eases friction

Eva Burrows

Trust is the lubrication that makes it possible for organizations to work

Warren Bennis

To our families and friends

Preface

This book, according to its title, is basically (but not exclusively) about biolubricants based on vegetable oils. The production and use of biolubricants is one of the reasons (as well as many others) why green chemistry is becoming more and more important nowadays, as the replacement for traditional lubricants is essential to carry out a sustainable economic and industrial growth, especially in developing countries or regions. In this book we will cover the most important aspects related to biolubricants based on vegetable oils, from its origin to its specific use. Nevertheless, as you read it, you will realize that this work covers many scientific aspects, from specific to general or vice versa. In that sense, this is not only a book about biolubricants, but also about general scientific concepts applied to biolubricants, which implies the general use of this book in many disciplines. In other words, this book promotes transversal knowledge, being a useful resource for a multidisciplinary group of students or professionals. In any case, to better understand the aim of this book, let's answer a few questions:

What is This Book About?

As previously mentioned, this book is not just about biolubricants. It could be said that this book is about science in general and about biolubricants in particular, pointing out how such a specific subject can be related to so many concepts or ideas. In turn, and according to our experience, learning about biolubricants is the perfect example about how an apparently simple topic can be interrelated with other unexpected (and equally interesting) concepts. If there are so many concepts related to biolubricants, can you imagine the knowledge network "out there" (from Chemistry, Physics, Energy, Mathematics, Materials Science, Medicine, etc.)? Indeed, many professions are based on this principle, starting with specific tasks to better understand more general activities. This book could inspire similar works where general terms are dealt from specific scientific cases, as this concept could perfectly work in

any discipline. We really encourage our readers to "pull a thread", and if this book is the starting point of such an enriching process, we will be really proud of it.

To Whom is it Directed?

This book is perfect for anybody who is curious and is interested in science. These are the two main requirements to enjoy this book, apart from a certain minimal science-based knowledge (even though we will try and explain everything aspect of biolubricants as clearly as possible, step by step). Thus, you will realize by reading this book that biolubricants (as many other interesting subjects) can serve as a transversal approach to learn a bit more about chemistry, chemical formulation, fluid dynamics, materials, engineering in general, etc. In a way, everything has to do with Chemistry, Engineering, Mathematics… That is the reason why we recommend this book for high school and university students, as it can be the "seed" to foster curiosity and learning from everything you can imagine.

In a more specific way, this book is recommended for providing practical ideas for teachers at different academic levels (especially high school and university for any scientific field), as well as for their corresponding students, who want to complete their knowledge about a certain subject included in this book.

Why is This Book Useful?

We consider that this book is useful for several reasons:

- This book is a clear example of how the most basic scientific concepts can be put in practice. Throughout its pages, we will try to explain "almost everything" about biolubricants (in double quotes, as it is impossible to cover this subject, even though it is so specific), giving as many didactic explanations as possible about every phenomenon included in this book. We believe that this philosophy is the perfect way to teach and learn, perfectly applicable to techno-scientific fields.
- It is structured in independent chapters whose content (albeit it is interrelated in general) can be specifically consulted, in the order that you prefer (even though we recommend to follow the proposed logical order, of course). This book can be very interesting to propose different practical examples based on general concepts. For instance, when chemical formulation of esters is covered, it is important to point out the importance of formulating every organic compound, as every chemical group has something to do with industrial or pharmaceutical applications. These details will be, one way or another, familiar to our students once they enter the labor market in the near future. We are sure you will not regret reading this book, as you are bound to face some aspects dealt with in this book in your professional career (even though you never work with biolubricants). Sooner or later, it will

ring a bell and you will remember this work! Then, why not come along with us to learn together about biolubricants and, to a greater extent, science in general?
- Above all, the usefulness of this book lies in the charming presentation of every idea or content, to promote curiosity and the desire to continue to expand knowledge, not necessarily about biolubricants. With multiple figures and tables (many of them self-explanatory), the understanding of complex concepts can be easier. Additionally, more than 50 exercises or questions (with their corresponding answers at the end of the book) have been included in most chapters, so that the reader can check his/her level of understanding.

What do We Hope You Can Learn?

We only hope you enjoy it or, at least, you enjoy some parts of this book. If you are a teacher, we hope you find our work useful to complete your teaching. If you are a student, we hope this book is a starting point for you to learn more about concepts that are perfectly applicable to a wide range of scientific and technical fields. In essence, we hope this book is useful for as many people as possible, not only students or teachers. And we hope they enjoy reading this book as much as we enjoyed writing and deepening this subject that, like many others, seems to have no end.

We would like to finish this preface with the quotes included in this book by Eva Burrows and Warren Bennis. The concept of lubrication is so present in our lives that it can be used metaphorically in such lofty ideas like love and trust. In this troubling and dehumanized world (with too much hostility, conflict and resentment), apart from the biolubricants dealt in this book, we need as many of these "spiritual" lubricants as possible like love, trust or curiosity. Concerning the latter, we hope that this book can contribute to foster a healthy curiosity (because, sometimes, it is not that bad saying "I don't know") to know, discover or inquire… engaging future young researchers with a positive attitude in their professional and scientific careers (and please, do not contribute to the "rat race" as Bob Marley said)… in other words, we would be happy to contribute to build your own way. Thank you for your trust in us and we hope you enjoy this book.

Sincerely,
The authors
Sergio Nogales Delgado
Carmen María Álvez Medina
Juan Félix González González

Badajoz, Spain

Acknowledgments

There is an old saying in Spain that goes “Es de bien nacidos ser agradecidos” (similar to “one good turn deserves another”), and that is the reason why we started this book by writing this section. This way, we will “recharge” our positive energy to accomplish such a wonderful challenge!

Firstly, we would like to express our gratitude to whoever has this book in his hands, showing an interest in scientific issues. You are the main reason why we have written this book! You probably are a teacher who wants to brush up a specific concept or propose different contents for your lessons, or you are a student. If that is the case, we are doubly grateful, as thanks to students like you, we have learned a lot during our pleasant adventure of knowledge, encouraging us to develop most of this book based on their doubts, curiosity, preferences, etc. As you can imagine, we cannot appoint all our students, as the list would be endless and we do not like to skip anyone but let us thank one former student (Carmen María Álvez Medina), who became the co-author of this book. A triple acknowledgment, as it is a real pleasure to see our students “grow up” academically and professionally, developing all their potential.

Secondly, we thank our university and many of its components who, one way or another, have helped us to develop this work about biolubricants. In that sense, it should be pointed out the role of the great professor, Prof. Dr. José María Encinar Martín, who was a teacher, colleague and friend (at different life stages of each author), whose wisdom is on a par with his kindness and humility. Possibly, without his career in the Department of Chemical Engineering and Physical-Chemistry, this research line about biolubricants would have never been possible and, therefore, the completion of this book (at least by us). Also, many of the members of the abovementioned department have directly or indirectly done their part by giving us advice, support or education about some of the specific topics of this book. Special mention for Nuria Sánchez Sánchez, whose expertise in these subjects was essential to leave a great legacy in our department. Equally, we cannot forget our colleagues Juan Carlos Aldana Sánchez, whose passion for photography has improved the quality of this book, and Alejandro Martínez Martín, who has contributed with the design of many of the figures included in this book.