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22 November 2023

Examiner report on the presentation of the DSc thesis Carbon-Neutral Cycle Construction and Atom-Economical Reactions Based on Calcium Carbide in Organic Synthesis by Konstantin Rodygin.

The DSc Thesis presentation submitted by Konstantin Rodygin is comprised of a Russian version (62 pages long), which is mirrored by its English variant (56 pages long). The following chapters make up the report: Introduction, The Main Content, Conclusions and Acknowledgements followed by a list of original publications by the candidate in peer-reviewed journals covering the main achievements of the work. The candidate made either a significant or major contribution to the published outcomes. The overall aim of the Thesis is to develop carbo-neutral approaches to obtain a wide range of chemical compounds employing calcium carbide. The Main Content is further subdivided into sections reflecting the objectives of the research: (i) atom-economic synthesis using calcium carbide; (ii) catalysts derived from calcium carbide; (iii) synthesis of calcium carbide from carbonaceous waste; (iv) synthesis of composite materials from calcium carbide residues and (v) carbide sludge utilization to include production of hydrogen. This represents a diverse set of topics covered by the overall aim to achieve carbon-neutral chemical technology. The significance of the topics covered in the Thesis is their alignment with the general trends to minimise reliance on fossil sources. Therefore, the theme of the work is undoubtedly highly relevant and timely. Furthermore, the training of researchers in these areas is highly appropriate to the employment sector.

The Introduction to the Thesis briefly highlights the significance and timeliness of the research presented in the work. The topics of the Thesis are placed into the context of the recent advances in this area. The results of the work were published in 26 original papers complemented by 8 reviews.

It is important to highlight that the work is comprised of both academic research, which included the development of new avenues of chemical synthesis using calcium carbide and studies of the underlying reaction mechanisms and applied research dedicated to the development of new technologies for the production of calcium carbide and waste utilization. Of the research achievement, I particularly wanted to highlight the facile synthesis of ^{13}C and ^2H labelled compounds, and the practical synthesis of 1,2-bis(phosphino)ethanes. From the practical viewpoint, I like a two-step synthesis of acetaldehyde and preparation of encapsulated Pd catalysts that retained activity after multiple uses.

The conclusions reflect the Aims and Objectives of the work, they summarise the main research achievements. It can be concluded that an original and significant contribution has been made to this contemporary area of research. In general, the thesis is well-written and clearly presented. The English version has a few typographic and grammar errors, though this does not affect the content presentation.

The Thesis meets the basic requirements established by Regulation No. 11181/1 dated November 19, 2021 "On the procedure for awarding academic degrees at St. Petersburg State University", the applicant Konstantin Sergeevich Rodygin deserves the award of the academic degree of Doctor of Chemistry sciences in Organic chemistry, scientific specialty 1.4.3. No violations of paragraphs 9 and 11 of this Procedure were found in the Thesis.

A handwritten signature in black ink, appearing to be "A. Malkov", with a long horizontal stroke extending to the right.

Andrei Malkov