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Institute of Organic Chemistry and Biochemistry
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Ph.D. Thesis by Isabel Gay Sánchez „Synthesis and application of helicene-based N-heterocyclic carbene ligands”

Supervisor's evaluation: RNDr. Ivo Starý, CSc.
Institute of Organic Chemistry and Biochemistry of the CAS

Isabel Gay Sánchez prepared her Ph.D. Thesis under my guidance at the Institute of Organic Chemistry and Biochemistry of the CAS in the years 2014-2020. In fact, she began doctoral studies earlier with Dr. Šrogl at the same Institute to investigate thioacetylenes in Sonogashira-type cross-coupling reactions. After his move to the USA, she joined my group to focus on the development of new helically chiral ligands for enantioselective transition metal catalysis. As part of her research activities, she participated in several projects supported by the Grant Agency of the Czech Republic.

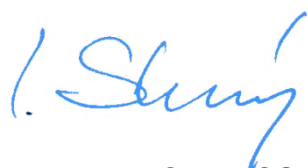
The main task of Isabel Gay Sánchez' research was to develop a general method for the preparation of new helical NHC ligands and apply them in enantioselective catalysis. She chose conformationally locked aminooxa[5]helicenes and aminooxa[6]helicenes that were converted to the respective helicene-based imidazolium salts as precursors of helical N-heterocyclic carbenes. This class of compounds had never been used in enantioselective catalysis prior to this study. She succeeded in employing them in the Ni⁰-catalysed enantioselective [2+2+2] cycloisomerisation of aromatic triynes to obtain highly enantioenriched model helicene derivatives. This is her most significant result, which was published in *Chem. Commun.* **2017**, 53, 4370–4373, where she is the first author. In addition to this project, Isabel Gay Sánchez also participated in research on the synthesis of sulfanylated helicenes (*J. Org. Chem.* **2020**, 85, 248–276) and the use of helicene-derived iridacycles as catalysts in enantioselective reduction processes (to be published).

Isabel Gay Sánchez contributed significantly to the rational development of new chiral ligands or catalysts derived from helicenes and their use in enantioselective catalysis, which was truly a pioneering effort in numerous respects. The tasks she worked on were difficult, but she completed them with honour and achieved significant results in the field of helicene chemistry and catalysis. She is a very careful and capable experimental chemist; the first-class quality of work is the dominant feature of her research activities.

Based on the course of doctoral studies and results obtained, I can declare that Isabel Gay Sánchez successfully completed her scientific training. She demonstrated the necessary knowledge, diligence and determination to overcome the difficulties of demanding modern research. She is well prepared to be part of a research team that is active in the field of organic synthesis or catalysis. Isabel Gay Sánchez is undoubtedly one of the most reliable and personally great students I have had the privilege of working with.

Summing up, the submitted Ph.D. Thesis by Isabel Gay Sánchez provides clear evidence that the candidate is worthy of unconditional admission to the defence of her Ph.D. Thesis. I recommend accepting the Thesis without hesitation.

Prague, 13 January 2021



RNDr. Ivo Starý, CSc.