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Efficient Solvent-Free Synthesis of Ni(II)- Dithiocarbamato Complexes using Mechanochemistry

Slađana Kovačević,[a]* Marija Ristić [b], Jana Mišurović [a], Zorica Leka [a] and Milica Kosović Perutović [a]

[a]*Faculty of Metallurgy and Technology, University of Montenegro, Podgorica, Montenegro*

[b]*Faculty of Science, University of Kragujevac, Kragujevac, Serbia*

**sladjanak088@gmail.com*

Previous research has confirmed the possible coordination of the ligand ammonium-iminodiacetatedithiocarbamate, $(NH_4)_3$idadtc, with transition metals, including Ni.[1] Mechnanochemical synthesis of $(NH_4)_3$idadtc and Ni(II) ions was examined with the aim of optimizing the synthesis, avoiding the use of HCl and obtaining a purer product. The application of mechanochemistry, which is also known as “green chemistry", leads to saving time and energy, as well as reducing the use of organic solvents and results in low waste.

This experimental work was carried out in a planetary ball mill. Numerous syntheses were performed with different conditions. Jars and balls made of zirconium oxide and stainless steel were used. Reactions with different number and size of balls as well as grinding speed and time were tested. IR spectra were recorded between 5 minutes and 1 hour, showing that the same product is obtained regardless of the synthesis conditions. The complexes were characterized by elemental analysis, IR and UV-Vis spectroscopy. Analysis confirmed that Ni(II) ions are coordinated through the sulfur atoms. All applied conditions resulted in high purity products which did not require additional post-synthetic treatment. This research showed a great potential of mechanochemistry as a novel clean synthetic approach for sustainable synthesis.

Keywords: mechanochemistry, dithiocarbamates, green chemistry

References

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