

DESIGN AND SYNTHESIS OF ORGANIC NONLINEAR OPTICAL MATERIALS

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INTRODUCTION.

A new class of materials based on octupolar symmetries has been proposed for nonlinear optical (NLO) applications in early 1990s [1]. Unlike traditional dipolar systems octupolar molecules lack permanent dipole moments and have better chances to adopt noncentrosymmetric packing. The objective of this work is to prepare cubic octupoles based on *trans*-porphyrin dimers; these cubic systems are expected to show high nonlinearities at molecular as well as crystalline scale.

MATERIALS AND METHODS.

Trans-porphyrins were synthesized by Lindsey Method [2]. First dipyrromethane, an intermediate product, was synthesized by condensation of pyrrole and aldehyde. Electron deficient nitrophenyl and cyanophenyl groups are used in the synthesis of dipyrromethanes. Then these dipyrromethanes reacted with different types of aldehydes to give *trans*-porphyrins. Zinc metal insertion accomplished by refluxing zinc salt and corresponding *trans*-porphyrin in DMF. Synthesized compounds were characterized by ¹H-NMR and UV-Vis spectrometry. Metallated porphyrins were mixed together with bidentate ligands (pyrazine DABCO, and 4,4-bipyridyl) to form porphyrin dimers.

RESULTS AND DISCUSSION.

Figure 1 shows synthesized 12 *trans*-porphyrins. Bulky naphthyl group is used to influence the conformational rotation of dimers. Also different electron withdrawing and donating groups are used to examine host-guest properties of these porphyrin networks.

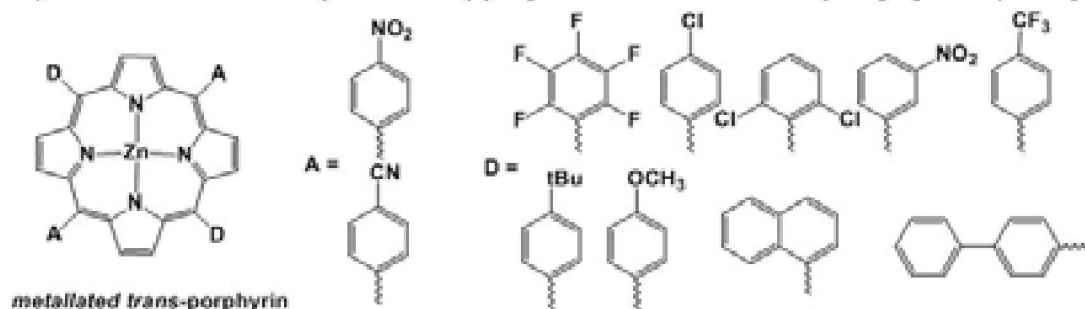


Figure 1: Synthesized *trans*-porphyrins

Crystallization of these porphyrins with bidentate ligands is underway. Nonlinear activity of noncentrosymmetric dimers will be measured.

CONCLUSION.

A modular approach in the synthesis of porphyrin dimers has been used. By altering A and D groups, metal cations, and ligands, a large range of porphyrin dimers will be synthesized.

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