Organic photovoltaics hold the potential for an inexpensive alternative to traditional silicon in solar cell production. Dye-sensitive solar cells imitate photosynthesis by using an organic dye to produce electron-hole pairs from incident photons. Promising candidates for these dyes include porphyrins, phthalocyanines and related molecules, all of them characterized by a transition metal atom surrounded by a cage of four nitrogen atoms. We have performed NEXAFS spectroscopy on such molecules to determine their LUMO, the oxidation state of the transition metal, and its spin state. The transition metal and the nitrogen cage are excited selectively by using the appropriate transition metal 2p edge and the nitrogen 1s absorption edge.