PHYSICAL CHARACTERIZATION AND MICROSCOPIC STUDIES OF *PORITES* SPECIES FROM SABAH

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ABSTRACT

PHYSICAL CHARACTERIZATION AND MICROSCOPIC STUDIES OF *PORITES* SPECIES FROM SABAH

Physical characterization of *Porites* species from Sabah have been studied by using X-Ray Diffraction (XRD), Fourier Transform Infrared Spectroscopy (FTIR), Fourier Transform Raman Spectroscopy (FT-Raman) and Scanning Electron Microscopy (SEM). The purpose of this research is to study physical characteristic of 3 powder particle sizes; ≤38, ≤53, and ≤106 μm of *Porites* species. *Porites* skeletons used in these studies were *Porites australiensis*, *Porites cylindrica*, *Porites lutea*, *Porites lichen*, *Porites digitata*, *Porites nigrescens*, *Porites rus*, *Porites annae* and *Porites* sp. It was found that crystallinity is increased from *Porites lutea* (lowest crystallinity) to *Porites cylindrica* (highest crystallinity). Low value of FWHM indicates that the crystals are defect free and periodically arranged while high value of FWHM indicates that the crystals are randomly arranged or have low degrees of periodicity. Crystallite sizes were found to be in the range of 1007.781–1706.040 Å and *Porites* species are belonged to two groups (smaller and larger crystallite sizes respectively). It is found that all *Porites* species exhibit orthorhombic crystal structures. From the values of M1, *Porites* species are categorized into two groups; the first group shows high values of M1 with biogenic aragonite cell constant while the second group shows high values of M1 with synthetic aragonite cell constants. It can be concluded that species with high value of M1 has peak data profiles which are compatible with the fitted cell constants. FTIR spectra show the variations in the v_1, v_2, v_3 and v_4 bands strength as a function of particle size. Each band decreases in strength with decreasing particle sizes for all species. The size of particulate matter will affect the strength of absorptions because electromagnetic radiation will interact with particulate matter differently for different particle sizes as the ratio of surface to volume scattering changes. FT-Raman spectra show the effect of particle size on the wavenumber and intensity of carbonate symmetric stretching mode, v_1 bands. It is found that the intensity of v_1 band decreases with decreasing particle size. These changes in the wavenumber of Raman bands with particle size are inherent properties of individual minerals. From morphological study, corallites distribution of *Porites* species can be divided into even and uneven. SEM at low magnification (100X) shows fine structures of intact coral skeletons. SEM at high magnification (2000X) however shows broken and fragmented rod-shaped aragonite crystals of some *Porites* species due to the effects of grinding process. In conclusion, there are significant differences of physical characteristic between these three particle sizes of *Porites* powder samples.