

Investigation of hyperfine interactions in immunoglobulin G with perturbed angular correlation spectroscopy using ^{111}Cd

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Hyperfine interaction parameters have been used to investigate physical properties of biomolecules from different isotypes of immunoglobulins G (IgG1, IgG2a and IgG2b). Immunoglobulin IgG1 induces a pattern of response type Th2 that corresponds to an allergic immunological response, whereas immunoglobulin IgG2 induces a pattern of response Th1 that corresponds to a cellular immunological response, suited for response against parasites. Hyperfine interactions were measured by perturbed gamma-gamma angular correlation (PAC) spectroscopy using $^{111}\text{In}(^{111}\text{Cd})$ and $^{111\text{m}}\text{Cd}(^{111}\text{Cd})$ as probe nuclei. The measurements were carried out for both the complete and fragmented molecules at 295 K and 77 K, and both static as well as dynamic interactions were observed. Results of both measurements were used to calculate the rotational correlation time for each studied molecule. The complete and fragmented molecules showed different dynamic interactions. It was therefore concluded that the PAC technique is quite adequate for differentiating between the isotypes of immunoglobulins as well as their dynamic behavior if adequate nuclear probe is utilized with rigorous control of measuring conditions. The hyperfine parameters obtained are related to the physical properties of each molecule in an attempt to understand the difference in their biological function.