

Investigation of sacred art book using EDXRF technique

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Until the end of the 1960s, it was common practice to give young people a Brazilian missal book at their First Communion. This prayer book was a special gift to celebrate a holy day. Usually, both the cover and the back cover were made of mother-of-pearl with a golden geometric design, hard spine (leaf stitching) and golden edges (gold plated). First Communion prayer books were small (120 x 75 mm) and profusely illustrated with many sacred figures, many prayers and other commandments of the Catholic Church. Furthermore, these books had a standard edition: they were published with 78 pages with an index on the last page. As these prayer books were expensive (made of mother-of-pearl and gold), there were faux editions with celluloid covers and bronze details. Currently, this devotional Brazilian missal book is considered a work of sacred art. In this study, a First Communion prayer book, printed in 1955 by Edition IDEC in Portuguese (120 x 75 mm), was investigated using EDXRF technique for heritage appreciation. The measurements were performed using an X-Ray Spectrometer (X-123 SDD model from Amptek[®]), with an Ag and Au X-Ray targets. The characteristic fluorescent X- rays emitted from the samples were measured with a Si Drift detector (25 mm² x 500 μm) with Be window (12.5μm). The excitation conditions were optimized at 30 kV and 15 μA and a counting time of 300 s. Calcium presents the major elemental concentration (Ca 93%, Ni 4%, Fe 2%, Ti 1% and Zn 0.01%) on the front and back covers, which indicates the presence of mother-of-pearl (CaCO₃). The golden geometric design and metallic detail (“shield-shaped” metal plate centered on the front cover) are composed of a metallic alloy containing mostly gold and silver: Au (70%), Ag (13%), Cu (7%) and traces of Zn (1%), Mn (1%) and Fe (0.1%). Results also indicate that the edges are gold-plated (Au 93%, Cu 3%, Ag 2%, Ni 2%, Zn 0.012% and Fe 0.001%). These data can aid in identification of forgeries and also contribute to technical art history of worship objects in a country so influenced by Catholic faith, such as Brazil.