On the ionization energy of the semirelativistic Pauli-Fierz model

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We consider the semi-relativistic Pauli-Fierz model which is defined by the relativistic kinetic energy $\sqrt{[\sigma \cdot (\mathbf{p} + e\mathbf{A}(\hat{\mathbf{x}}))]^2 + M^2} - M$, instead of the non-relativistic one $[\sigma \cdot (\mathbf{p} + e\mathbf{A}(\hat{\mathbf{x}}))]^2/2M$, in the Pauli-Fierz Hamiltonian. We show that the ionization energy of the semi-relativistic Pauli-Fierz model is strictly positive for all values of a coupling constant and particle mass $M \geq 0$. The total Hamiltonian contains the nuclear potential $V(\mathbf{x})$, and it is assumed that the semi-relativistic Schrödinger operator $\sqrt{\mathbf{p}^2 + M^2} - M + V(\mathbf{x})$ has a negative energy ground state.