

## **Design of novel reducing agents for direct thermographic materials**

We describe the systematic design and evaluation of new phenolic reducing agents (developers) for dry-processed, silver-based direct thermographic (TG) black-and-white films for medical diagnostic imaging. In TG media, heat exposure as short as 7 ms/pixel is used to induce development, thus highly active developers are needed. Our approach to this problem combined synthesis, coating evaluation, and electronic structure calculations to provide insights into the TG development mechanism. The computed highest occupied molecular orbital (HOMO) energy of the neutral developer did not correlate with maximum image density (D-max). Rather, the best developers (high D-max, low fog) had relatively low phenol O-H deprotonation energies and high-lying phenolate anion HOMO energies, implying that, in the TG process, silver is reduced primarily by phenolate ion. This information allowed discovery of new categories of potentially useful TG developers, including orthoaminophenol, para-aminophenol, halophenol, and resorcinol derivatives.

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