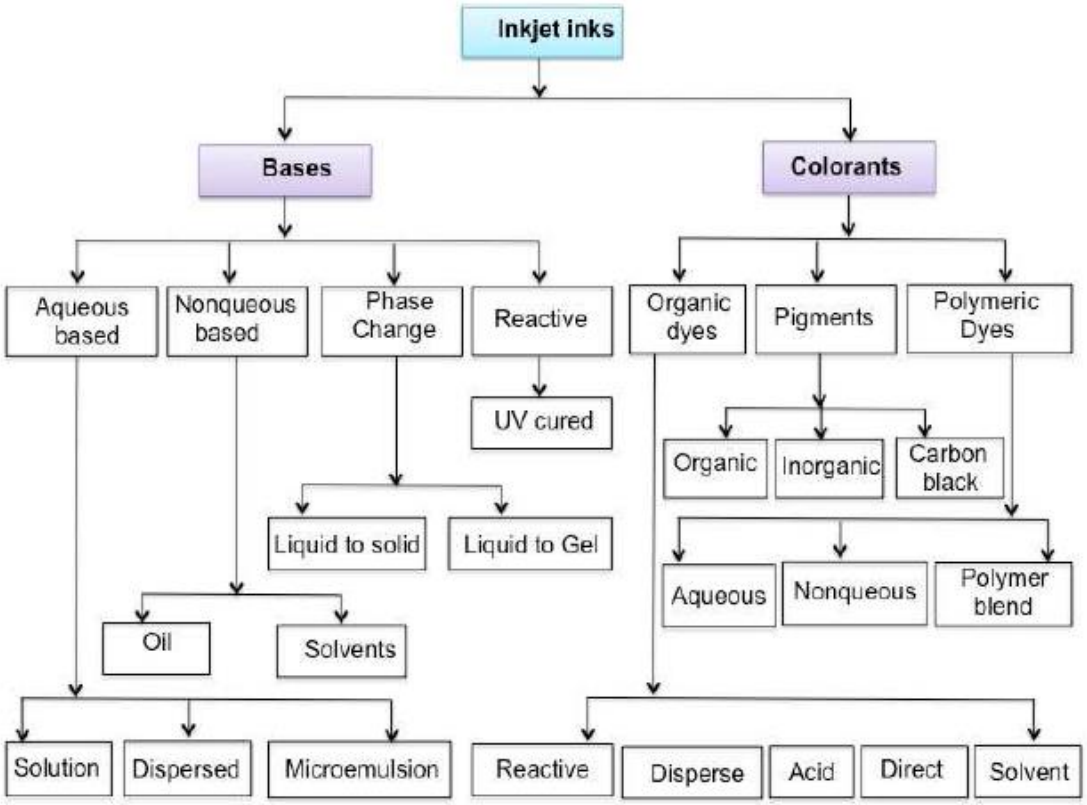
Application Note 130 Inkjet Inks

Many companies in the inkjet industry use the Acorn Area in formulation development and/or manufacturing. Inkjet ink formulations encompass a wide variety of colloidal systems, as shown in the following figure:



[1]

Inks are comprised of a base and a colorant. The bases and colorants may include a variety of different formulations. Performance of an inkjet formulation has many different criteria: inks should be low in viscosity to flow through the jet, yet quickly form a dried dot on the substrate with good definition and color development. The table below illustrates some typical components in an inkjet formulation:

Table 1: General Composition of Water-Based Inkjet Inks(Le 1998)

Component	Function	Concentration (%)
Deionized water	Aqueous carrier medium	60 - 90
Water soluble solvents	Humectants, viscosity controller	5 - 30
Dye or pigment	Provides color (Chromophore)	1-10
Surfactant	Wetting agent, penetrating agent	0.1 - 10
Biocide	Prevents growth of biological organisms	0.05 – 1
Buffer	pH controller	0.1 – 0.5
Other additives	Chelating agent, binder, defoamer etc.	>1

[2]

[1] Le 1998
[2] Ibid.

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Acorn Area measurements can provide valuable information regarding many different aspects of a formulation. For example, color development is strongly influenced by the quality of the pigment dispersion. XiGo Nanotools has several applications notes which discuss how measurements of wetted surface area correlate well with dispersion quality. To achieve a stable dispersion, pigments must be milled, with an appropriate level of surfactant to keep the particles from aggregating. Optimizing milling conditions to achieve a desired state of dispersion is easily measured using the Acorn Area see ***XiGo Nanotools Applications Notes 105, 106, & 108***.

Understanding the interaction of a given surfactant and a pigment particle is also important. Too little surfactant and particles will aggregate, plugging jets. Too much surfactant will cause foaming, again a processing and performance problem. Selecting the right surfactant and optimizing the correct concentration for a given pigment dispersion is easily determined using the Acorn Area, see Applications Note 107. In some cases, more than one surfactant may be added to a formulation. How do the surfactants interact at the particle surface? Do both adsorb, does one displace the other? These are difficult problems to understand but are critical to optimizing product performance. ***XiGo Nanotools Applications Notes 116 and 117*** help understand these phenomena.

Binders such as acrylic polymers are often added to inkjet formulations. In addition, the inkjet base may include humectants to slow ink drying. Understanding the correct molecular weight, distribution, and solvent goodness in the base as well as the affinity of the polymer for the pigment surface is a non-trivial problem. These applications notes can help.

The Acorn Area measurements are important to understand mixing bases and colorants can be challenging. How much shear is required? What is the optimal temperature? These are challenging questions. The Acorn Area has the ability to perform measurements over a range of temperatures used in inkjet processes. For inks which undergo a phase change, the state of dispersion as the formulation solidifies can be studied easily with the Acorn Area.

The Acorn Area is used by the World's leading ink manufacturers. To discuss your formulation development or quality monitoring needs in more detail, please contact us at: sales@xigonanotools.com or call +1 (844) 367-9446.