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Introduction

Reticular chemistry—Present and future prospects

This special issue of the *Journal of Solid State Chemistry*, titled Reticular Chemistry, is a sequel to one published five years ago with the title Design of Solids from Molecular Building Blocks [1]. The subject, now called reticular chemistry [2,3], is concerned largely (but in principle, not exclusively) with the synthesis and properties of metal-organic frameworks (MOFs), particularly those in which the components are linked by strong bonds such as occur in metal carboxylates. Thus it should be differentiated from, for example, the assembly of molecular crystals held together by hydrogen bonds or even the formation of "coordination polymers" in which metal atoms are coordinated with a multitopic organic component such as dipyridyl. Thus the targets of reticular synthesis are typically thermally robust and porous materials.

The papers published here reflect the increasing sophistication of and the change of emphasis on the subject, which is moving away from merely cataloging the methods of synthesis and structures of new materials toward the deliberate synthesis of materials designed to have novel and useful properties. The emerging properties have such considerable promise that the subject is surely one of the most rapidly growing areas of materials science—certainly the number of reports of new MOFs is growing very much faster than that of crystalline materials in general [3].

We start with a discussion of *design,* which in recent years has become for some a somewhat contentious word. We like the OED primary definition of the noun: "A plan or scheme conceived in the mind and intended for subsequent execution; the preliminary conception of an idea that is to be carried into effect by action; a project." We maintain that constructing a rational plan of making a MOF, or suite of MOFs, with desired structure and properties is exactly this, and we say we are proceeding by (intelligent) design. Some plans fail[1] and some designs are faulty, but the principle of proceeding by intelligent design remains—and, as Batten argues in this issue, although one never enjoys 100% success some of the surprises can be pleasant. We have outlined the principles by which targeted structures can be achieved, and emphasize that as targets become more specialized, increasing sophistication of design is necessary [2,3].

A pleasing aspect of the explosive growth of the subject is that there is growing awareness of the richness of the geometry of periodic structures and of the importance of understanding it. In this issue our earlier tutorial [4] is supplemented by accounts of some more advanced relevant geometrical topics.

Turning now to properties: It is now routine, one might almost say obligatory,[2] to characterize porous materials with sorption isotherms. With the accumulated data we are beginning to understand the principles underlying the capacity and selectivity of materials for gas sorption and storage (perhaps the properties of most immediate concern). Key references are given in several papers in this issue, but we call attention to two very recent contributions [5,6] that illustrate the importance of direct structural studies of materials with included guests.

[1]"The best laid schemes o' mice an' men/ Gang aft a-gley". Robert Burns.
[2]As emphasized before [1], porosity is a property that must be demonstrated rather than inferred.

It is to be expected in the near future that catalytic activity, particularly by materials with functionalized pores (*designed* active sites!), will be targeted similarly. Indeed this is the area we consider to be the current frontier and expect that in the next decade it will become a major area of chemical research. Beyond that lies the *terra incognita* of highly selective sensors, hybrid materials with hybrid properties, conducting porous materials, *etc.*

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